MANUFACTURES

BABCOCK & WILCOX LTD.

Babcock House, Farringdon Street,

LONDON E.C.4.

MAY, 1929. *Code Word:* "YTIVAGGIO" No. 925A.

MANUFACTURES

OF

BABCOCK & WILCOX

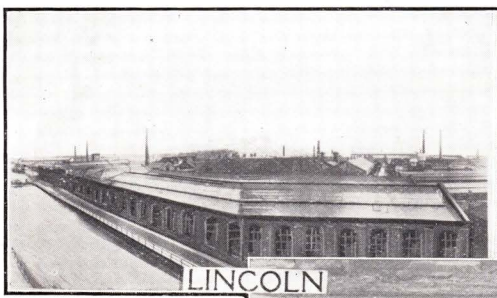
LIMITED

BABCOCK & WILCOX, LIMITED.
HEAD OFFICES: BABCOCK HOUSE, FARRINGDON STREET, LONDON.

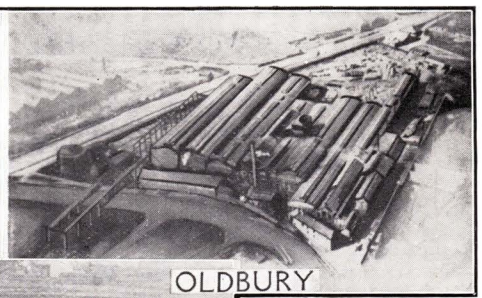
FOREWORD

IN the following pages are illustrated and briefly described some of the principal Manufactures of the BABCOCK & WILCOX organization, detailed particulars of which will be gladly communicated to Engineers and Steam Users, who may be interested to learn more fully of the scope and variety of the Company's activities.

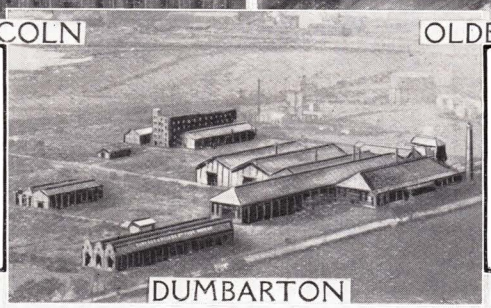
SOME WORKS OF THE BABCOCK & WILCOX ORGANISATION



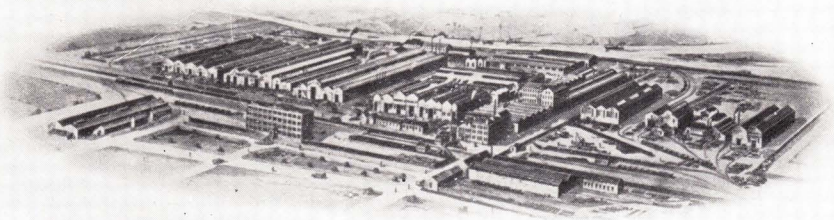
LINCOLN



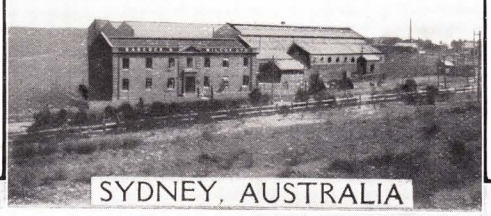
OLDBURY



DUMBARTON

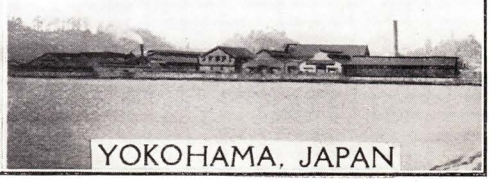


RENFREW WORKS. Occupying nearly 100 Acres



SYDNEY, AUSTRALIA

MILAN, ITALY



YOKOHAMA, JAPAN

BABCOCK & WILCOX Limited

Head Offices :

BABCOCK HOUSE :: FARRINGDON STREET

Telegraphic Address : " BABCOCK CENT. LONDON."

LONDON, E.C. 4.

Head Office Telephone: No. 6470 CITY (8 lines).

Cable Address : "BABCOCK, LONDON."

Principal Works : RENFREW, Scotland.

Branch Works : OLDBURY AND LINCOLN, ENGLAND ; DUMBARTON, SCOTLAND ; AND AUSTRALIA.

ALLIED COMPANIES :

UNITED STATES OF AMERICA : The Babcock & Wilcox Company, 85 Liberty Street, NEW YORK.
FRANCE : Société Française des Constructions Babcock & Wilcox, 48 Rue La Boëtie, PARIS.
SPAIN : Sociedad Española de Construcciones Babcock & Wilcox, 28 Calle de Ercilla, BILBAO.
GERMANY : Deutsche Babcock & Wilcox Dampfkesselwerke Actien-Gesellschaft, OBERHAUSEN, Rheinland.
HOLLAND : N.V. Central Bureau Babcock & Wilcox-Stork voor Nederland en Koloniën.
Kantoor : Heerengracht 213, Hoek Raadhuisstr, AMSTERDAM.
CANADA : Babcock-Wilcox & Goldie-McCulloch, Ltd., GALT, Ontario.
ITALY : Societa Anonima Officine Italiane Babcock & Wilcox, 14 Via Carducci, MILAN.
JAPAN : Toyo Babcock Kabushiki Kaisha, 1 Isogo-Machi, YOKOHAMA.

BRANCH OFFICES :

GLASGOW : 147 St. Vincent Street.
MANCHESTER : 230 Deansgate.
LIVERPOOL : 7 Rumford Street.
NEWCASTLE : Collingwood Street.
MIDDLESBROUGH : The Exchange.
CARDIFF : 102 St. Mary Street.
BIRMINGHAM : Winchester House, Victoria Square.
SHEFFIELD : 14 Bank Chambers, Fargate.
BRUSSELS : 23 Rue de la Limite.
SYDNEY : Head Office, Regents Park. Union House, George Street.
MELBOURNE : 84 William Street.
BRISBANE : New Zealand Insur. Building, Queen Street.

BUENOS AIRES : Edificio Boston.
LIMA : 399, San Jose.
MEXICO : 56 Ave. Uruguay, Mexico City.
RIO DE JANEIRO : 9 Avenida Rio Branco.
BOMBAY : Exchange Building, Ballard Estate, Fort.
CALCUTTA : Wallace House, 4 Bankshall Street.
SHANGHAI : 1 The Bund.
SINGAPORE : Hongkong Bank Chambers.
JOHANNESBURG : Netherlands Bank Buildings.
WARSAW : 8, Piekna.

DISTRICT OFFICE.—BELFAST : Bedford Buildings, 7 Bedford Street.

REPRESENTATIVES AND LICENSEES* :

ADELAIDE : South Australia : Elder, Smith & Co., Ltd.
ATHENS, Greece : Alexander Zachariou & Co.
AUCKLAND, New Zealand
CHRISTCHURCH ,, ,,
DUNEDIN ,, ,,
WELLINGTON ,, ,,
} John Chambers & Son, Ltd.
CAIRO, Egypt : Sayer & Colley.
CAPE TOWN, South Africa : Reunert & Lenz, Ltd.
CHILE, S. America : Alexander Young (London) Ltd. Beaver-Proud Engineering Co., Valparaiso.

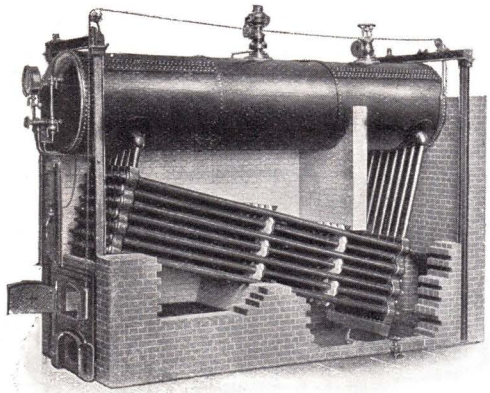
COLOMBO, Ceylon : Walker, Sons & Co., Ltd.
*COPENHAGEN, Denmark : Aktieselskabet Burmeister & Wain's Maskin-og-Skibsbyggeri.
*CRACOW, Poland : L. Zieleniewski Co., Ltd.
*GOTHENBURG, Sweden : Aktiebolaget Gotaverken.
HELSINGFORS, Finland : Maskin & Brobyggnads, Aktiebolaget.
*HENGELO, Holland : Gebr. Stork & Co.
*OSLO, Norway : A./S. Thunes, Mekaniske Værksted.
PERTH, Western Australia : McLean Bros. & Rigg, Ltd.
RANGOON, Burma : Irrawaddy Flotilla Co., Ltd.

*NOTE.—The names marked thus * are those of the Licensees.*

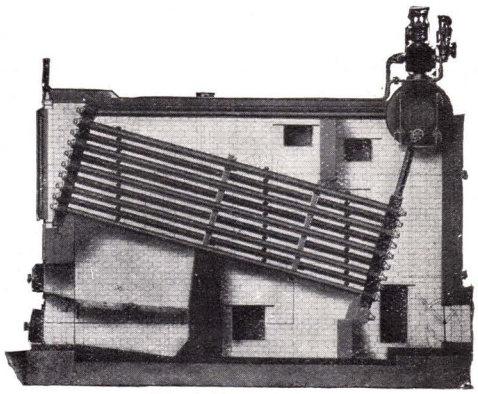
Telegraphic Address for all Offices : " BABCOCK " (*except* New York, Oberhausen, Oldbury, Liverpool, Bombay and Calcutta) ; for New York, " Gloveboxes " ; for Oberhausen, " Babcockwerke " ; for Oldbury, Liverpool, Bombay and Calcutta, " Boiler."

5,000 78416/CI. F.S.

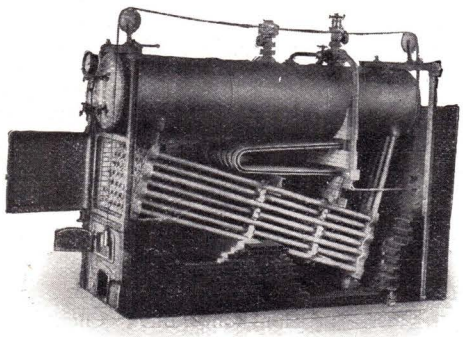
PRESENT TYPES OF BABCOCK & WILCOX WATER TUBE BOILER



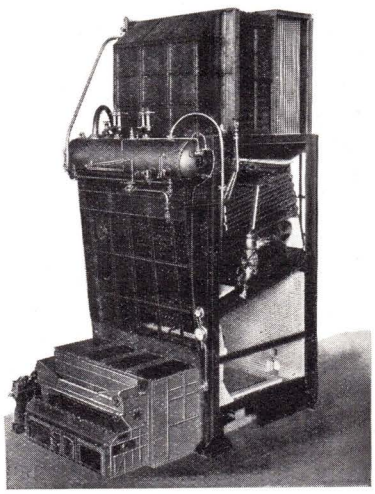
No. 1 W.I.F. Type
Babcock & Wilcox Land-Type Boiler.



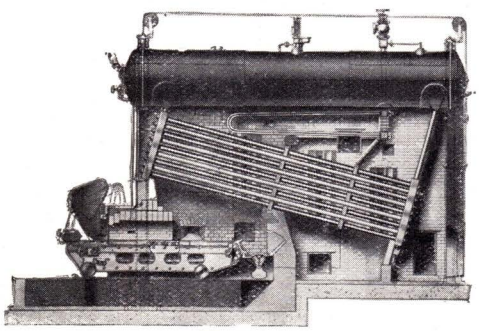
No. 4 (Class C.T.)
Babcock & Wilcox Cross-Type Boiler.



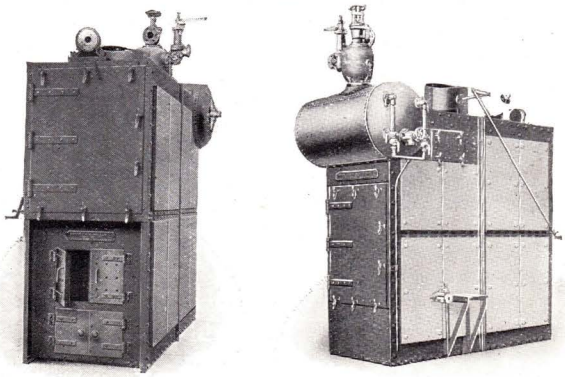
No. 2.
Babcock & Wilcox Boiler fitted with Superheater.



No. 5 (Class C.T.M.)
Babcock & Wilcox C.T. Marine Boiler for Land Purposes, fitted with Superheater, Chain Grate Stoker, Superposed Economiser and Air Heater. (Steel Cased.)



No. 3.
Babcock & Wilcox Patent Water-tube Boiler (Land Type), fitted with Superheater and Chain Grate Stoker, of which some 45,000 have been made for Evaporations from 360 lbs. to 40,000 lbs. of Water per hour.



No. 6 (Class P.)
Babcock & Wilcox Portable Boilers (Steel Cased).

PRESENT TYPES OF THE BABCOCK & WILCOX WATER-TUBE BOILER.

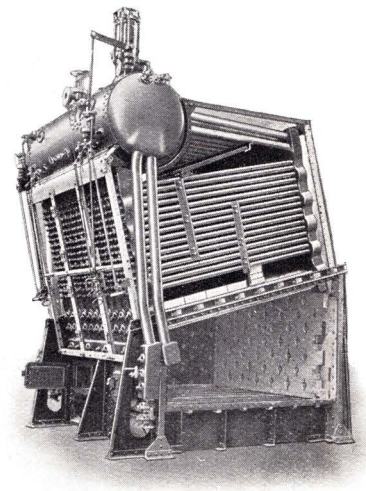
THE present types of the BABCOCK & WILCOX BOILER are the result of experiments with about twenty designs which successively were built for experiment, and are the outcome of over forty years' experience.

No. 1 shows the well-known W.I.F. type : This is constructed in every part of wrought steel ; the tubes are all seamless.

No. 2 shows the same boiler with patent superheater added.

No. 3 shows the mechanical chain grate stoker applied for coal burning.

No. 4 shows the " Cross-type " boiler, a design that lends itself particularly to easy road transport in mountainous districts. This type can be constructed in pieces below 280 lbs. in weight, and, even without the sectionalisation of the drum which this limit in weight calls for, there is, in a fairly large sized boiler of this construction, only one heavy piece over a ton in weight. The boiler is just as satisfactory as type No. 1, the only difference being that there is less steam and water capacity.



No. 7.—Babcock & Wilcox Marine Boiler with Steel Casing.

No. 5 shows a C.T. Marine boiler fitted with superheater, chain grate stoker, superposed economiser and air heater (steel-cased) for land service.

No. 6 shows a Portable Boiler of the same general construction as No. 4, but the brickwork setting is replaced by a special steel casing lined with refractory material.

No. 7 shows the Marine Boiler, also with steel casing.

The Boiler, constructed entirely of wrought steel, is composed of a number of sections, each consisting of several tubes, expanded at each end into staggered headers, or " uptakes " and " downtakes." The headers are provided with handholes, placed opposite the end of each tube, to permit of the cleaning, or, in case of need, the removal of a tube, each handhole being provided with a cap, fastened with a wrought-steel bolt and clamp and a cap nut.

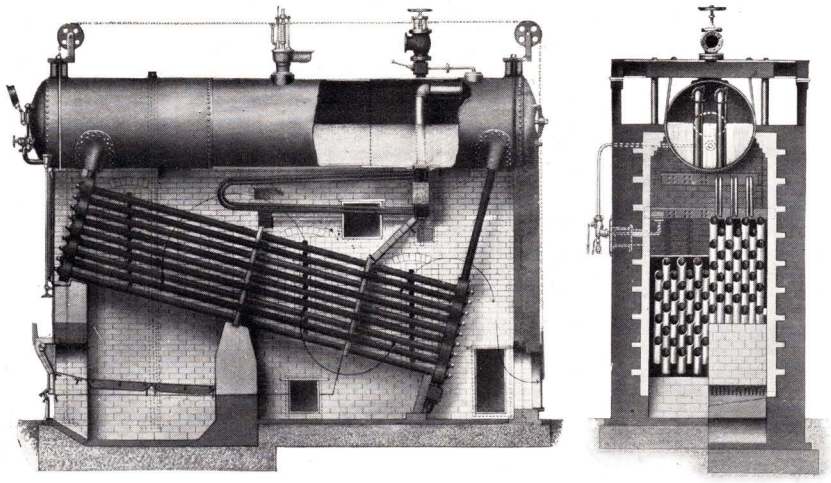
The top ends of each section are connected to a steam and water drum of ample capacity ; the sections are inclined, and at their lowest point are each joined to a mud drum.

The boiler is fitted with the usual mountings, comprising main steam stop-valve, safety-valve, feed-valve, blow-off valve, water gauges, and steam pressure gauge.

The entire boiler is self-supporting, the sections being free to expand in any direction, and all strains on the supporting structure are thereby divided.

These boilers are made for working pressures up to 1,500 lbs. per square inch, and solid-drawn steel steam and water drums are standard practice for all pressures over 650 lbs. per sq. inch.

PATENT STEAM SUPERHEATERS



BABCOCK & WILCOX PATENT WATER-TUBE BOILER, FITTED WITH SUPERHEATER.

OVER **31,000** OF THESE SUPERHEATERS AT PRESENT IN USE.

THE BABCOCK & WILCOX PATENT SUPERHEATER CAN BE ADAPTED TO ANY CONSTRUCTION OF BOILER, EITHER FOR LAND OR MARINE WORK.

THE BABCOCK & WILCOX PATENT STEAM SUPERHEATER consists of a number of solid-drawn steel tubes, bent into a U form, and expanded at each end into wrought-steel boxes or manifolds.

The steam from the boiler, entering the upper manifold box, divides amongst the U tubes, and during its passage through them becomes superheated, or raised to a higher temperature than previously, the pressure remaining unaltered.

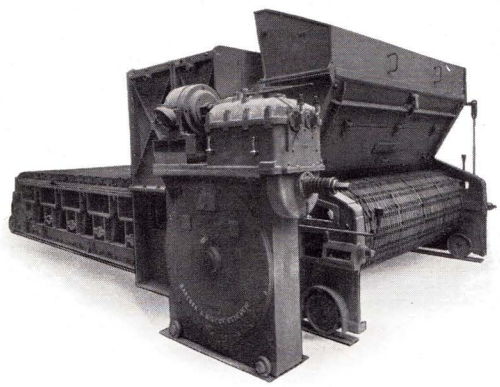
The use of superheated steam ensures a **saving of some ten to fifteen per cent.** in the steam consumption of even a modern highly economical engine, whilst with older and more wasteful engines the saving is considerably greater—thus the importance of the subject is self-evident.

THE BABCOCK & WILCOX SUPERHEATER is placed in a position where there is no detrimental condensation of the gases, and where the temperature is sufficiently high to ensure the steam receiving from 100° to 300° F. of superheat, or even more if desired.

For further particulars see separate Circular and Pamphlet.

PATENT CHAIN GRATE STOKERS

THE BABCOCK & WILCOX STOKER, of which there are over **24,000** in use, designed for the **efficient and smokeless combustion of semi-bituminous fuel.** The grate consists of an endless chain of short interlocking cast-iron grate bars, linked together, running on rollers, and driven by a revolving spindle at the front end of the stoker; the necessary power being transmitted through a link chain and sprocket wheels, from a shaft arranged either overhead or underground, or through a self-contained driving gear.



BABCOCK & WILCOX BALANCED DRAUGHT COMPARTMENT CHAIN GRATE STOKER, WITH HIGH GRADE DRIVE.

The starting or stopping of the stoker, or the variation of speed, is effected through the BABCOCK & WILCOX PATENT GEAR BOX, which provides for varying speeds.

Recently an improved COMPARTMENT-TYPE STOKER has been introduced which solves the problem of draught adjustment and places this stoker in the front rank for efficiency. This Stoker can be driven by a separate motor through a High Grade Driving Gear. The speed of the grate can be varied to suit the quality of fuel used.

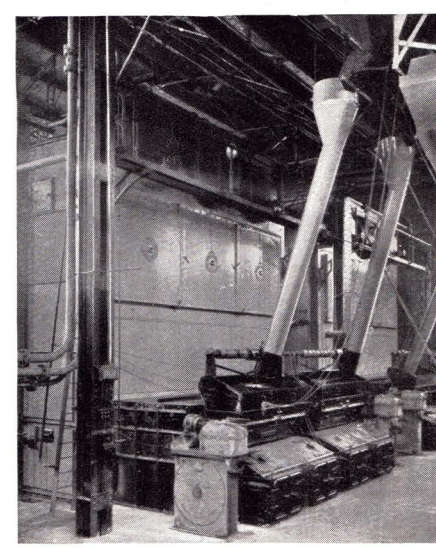
The Coal is fed over the whole width of the grate, the depth of fire being regulated by the adjustment of the vertically lifting fire door. The feed of the coal is slow, and the gases evolved from the fresh fuel pass underneath a highly heated fire-brick arch, and over the incandescent coal, and complete their combustion before coming into contact with the boiler-heating surface.

The fuel is gradually consumed as the grate travels on, and, when the dumping bars are reached, only ash and clinker remain, which fall into a receiving pit provided with a hinged bottom which is opened as and when required to allow of the clinker being removed.

The depth of the fuel and the **speed of the grate can be adjusted in a minute** to suit the conditions of draught available, the class of coal to be burned, and the evaporation required.

In case of need the stoker can also be worked by hand, by means of a crank placed on the end of the worm shaft. Should the working of the stoker from any cause be temporarily affected, hand firing may be resorted to.

An additional refinement, to ensure the even distribution of the fuel over the grate, consists of a Traversing Chute, as shown on accompanying illustration, by means of which the mixing of fine slack, peas and nuts is effected, resulting in an even fire-bed, instead of the larger nuts falling to the edges.

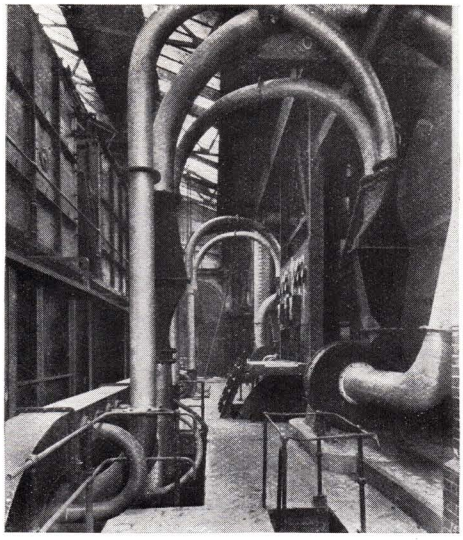


MECHANICAL CHAIN GRATE FORCED DRAUGHT STOKER ATTACHED TO BOILER, SHOWING THE AUTOMATIC TRAVERSING CHUTE.

For further particulars see separate Circular.

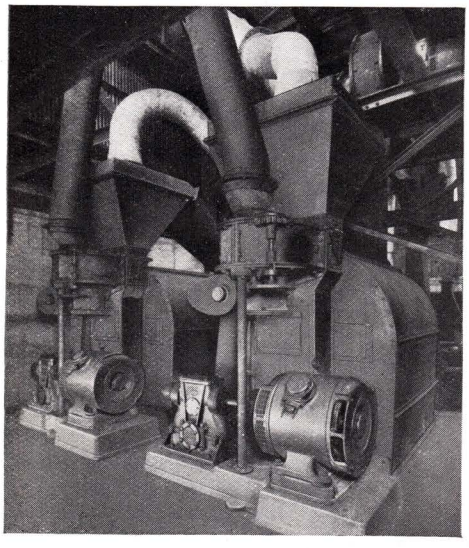
PULVERIZED COAL PLANT

DURING recent years appreciable progress has been made in connection with the use of pulverized coal for steam-raising purposes. BABCOCK & WILCOX LIMITED have devoted many years of research to the various problems connected with the use of coal in pulverized form, and are in a position to put forward complete equipments, not only for the Mills, Dryers, Burners, Feeders, Pumps and other equipment necessary, but also complete installations of any size combined with the use of water-cooled walls, water-cooled ash-pits and other special features of construction rendered necessary by the high temperatures involved.



VIEW SHOWING COMPLETE PULVERIZED COAL PLANT.

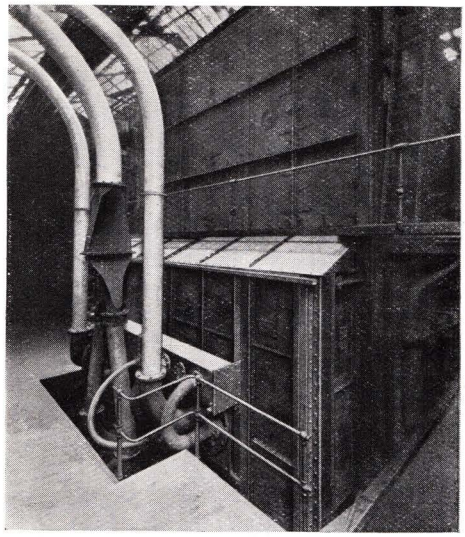
For the successful burning of pulverized coal it is particularly important that suitable drying apparatus should be installed in order that excess moisture may be removed from the fuel, and in this respect Babcock & Wilcox are able to put forward Dryers both of the Direct-firing Rotary Type and also Stationary Dryers in which waste gases are utilised for the purposes of pre-heating the fuel.



PULVERIZED COAL. GRINDING MILLS.

The second essential for the satisfactory operation of pulverized fuel plant is a thoroughly efficient grinding mill, and here again Babcock & Wilcox Limited are able to put forward several designs of the Fuller and Lehigh Mills, which are admitted to be among the most efficient for this purpose.

PULVERIZED COAL PLANT



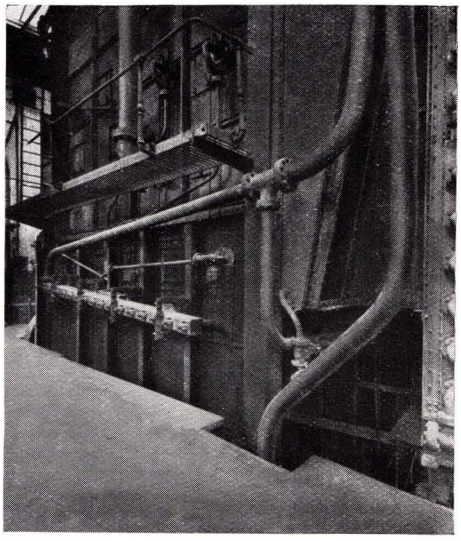
PULVERIZED COAL PIPE LINES AND FEEDERS.

With regard to fuel burners, considerable progress has been made quite recently, and Babcock & Wilcox were among the first to adopt the dispersive type of burners by means of which the overall dimensions of the furnace can be considerably reduced and a very high efficiency obtained.

The Company are able to offer complete installations, both of the central system and also with unit pulverizers. For central systems in connection with the transport of pulverized coal, where the mill house may be an appreciable distance from the actual boiler plant, the Fuller-Kinyon Pump, manufactured by Babcock & Wilcox, is accepted as the standard apparatus for this class of work.

For large pulverized fuel units suitable water-cooled walls are of the greatest importance, and in this connection the Company are able to put forward the Bailey Wall, which is considered the most efficient of its class.

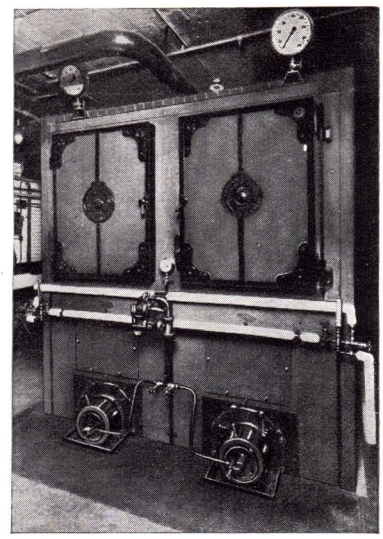
The Company have a large number of plants operating in this country and abroad, the individual boiler units varying in evaporative capacity from 30,000 up to over 200,000 lbs. of water per hour, and are prepared to put forward complete schemes in which the whole of the apparatus, including boiler, water-walls, mills and all accessory equipment, is manufactured in Great Britain at their own Works.



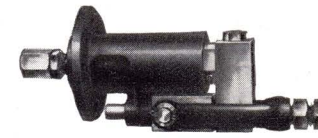
PULVERIZED COAL. WATER-COOLED WALLS.

OIL FIRING EQUIPMENT

OIL BURNER WITH STEAM AS THE ATOMISING AGENT.



BABCOCK & WILCOX BOILERS, OIL-FIRED, AT THE "DAILY NEWS AND WESTMINSTER GAZETTE" OFFICES.



OIL BURNER FOR PRESSURE SYSTEM OF ATOMISING.

THE RECENT DEVELOPMENTS IN THE SUPPLIES OF OIL and the question of its utilisation as a fuel is a matter of increasing importance, not only for marine purposes, but for general use on land.

The relative prices of coal and oil are generally the determining factors in their use for steam raising, but the merits of crude oil as a fuel for steam generation, in places where its cost compares favourably with other fuels, are briefly the following:—

An increase in boiler efficiency and completeness of combustion.

A constant and equal distribution of heat in the furnace.

A reduction in the cost of handling the fuel, as this can be done with a pump and one man can regulate the burners of a number of boilers.

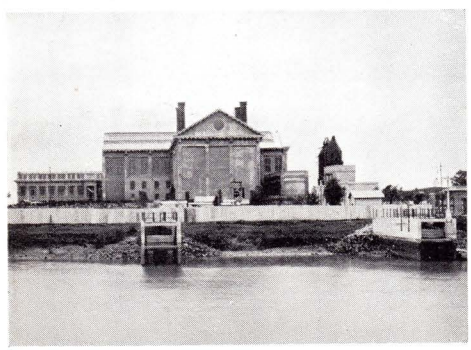
No wear and tear of grate bars, no ashes, dust or clinker.

The storage of oil fuel is simpler than the storage of coal, and oil does not deteriorate.

The control of steam production is easier and more effective and rapid than with solid fuels.

Instantaneous ignition and extinction of fire, and no smoke.

For further particulars see separate Pamphlets.



DOCK SUD POWER STATION, BUENOS AIRES.

DEVONSHIRE HOUSE, PICCADILLY.

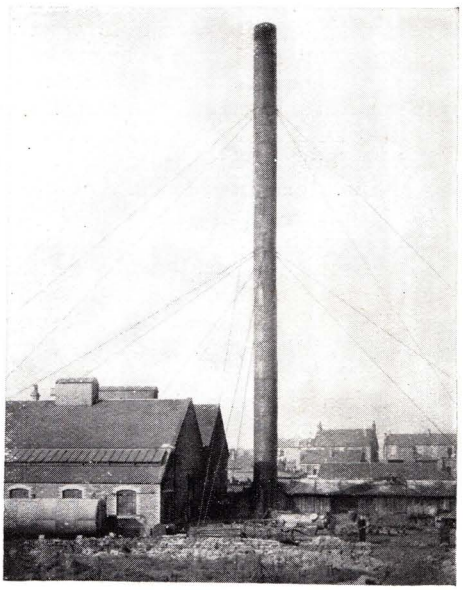
BABCOCK & WILCOX BOILERS, OIL-FIRED, INSTALLED IN BOTH THESE BUILDINGS.

STEEL CHIMNEYS

IN MANY PLACES STEEL CHIMNEYS are preferred to brick, particularly for export, and to meet such requirements we have standardised the construction of both Stayed and Self-Supporting types.

Steel Stayed Chimneys

Stayed Chimneys in the smaller sizes, where for use in this country, are supplied riveted up in lengths with angle iron flanges for bolting together. In the larger sizes, and in all cases for use abroad, they are sent with the plates rolled and punched ready for riveting, all rivets and a set of riveting tools being supplied. A heavy cast base plate with holding down bolts, and also the necessary guy ropes, straining screws, etc., being supplied.



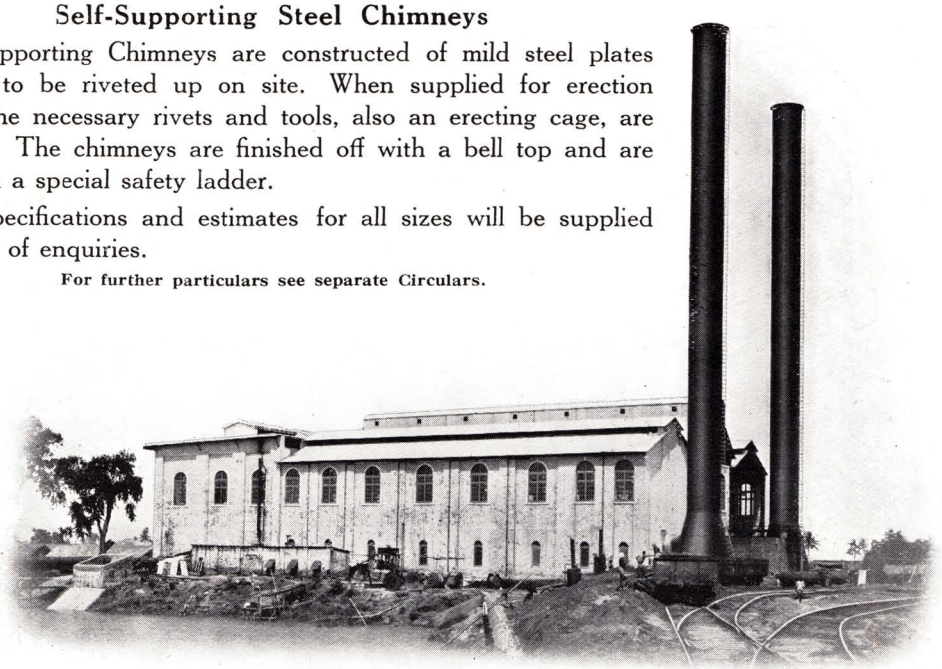
STEEL STAYED CHIMNEY, 125 FT. HIGH, 6 FT. 3 INCHES DIA. ERECTED BY BABCOCK & WILCOX, LTD.

Self-Supporting Steel Chimneys

Self-supporting Chimneys are constructed of mild steel plates arranged to be riveted up on site. When supplied for erection abroad the necessary rivets and tools, also an erecting cage, are provided. The chimneys are finished off with a bell top and are fitted with a special safety ladder.

Full specifications and estimates for all sizes will be supplied on receipt of enquiries.

For further particulars see separate Circulars.

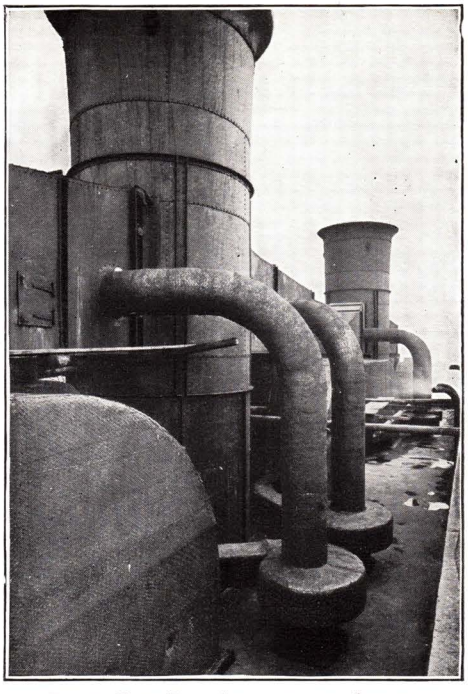


TWO BABCOCK & WILCOX SELF-SUPPORTING STEEL CHIMNEYS, 200 FT. HIGH, 12 FT. DIA. INSTALLED AT A POWER STATION IN CALCUTTA, INDIA.

DUST CATCHERS

WITH the growth in the size of Steam Raising Installations, the extended use of mechanical draught, and the increasing necessity for preventing any emission of grits and dust from chimneys, it has become almost standard practice to equip the modern boiler unit with Dust Catchers.

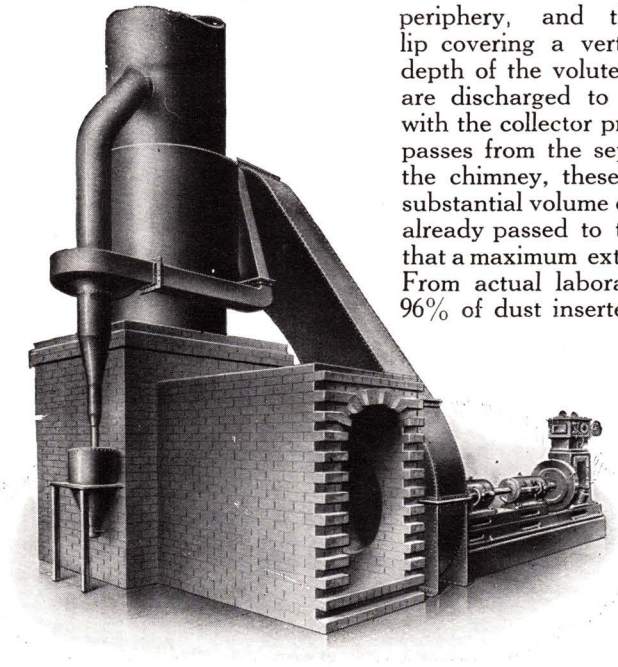
BABCOCK & WILCOX LTD. have carried out a number of investigations regarding the most efficient type of collector to adopt, and are satisfied that, with the apparatus, illustrated on this page, a very high percentage of grit is recovered. In this system the induced draught fan discharges the dust-laden gases into a separator, which takes the form of a hollow belt placed around the exterior of the chimney, some short distance from the base. This casing is arranged slightly eccentric to the chimney, and so forms a passage of constantly decreasing area. The induced draught fan discharges the flue gases into the wider portion of this casing so that they have to describe a spiral path round the chimney before entry.



PATENT FLUE DUST COLLECTORS AT CENTRAL ELECTRIC POWER STATION, LONDON.

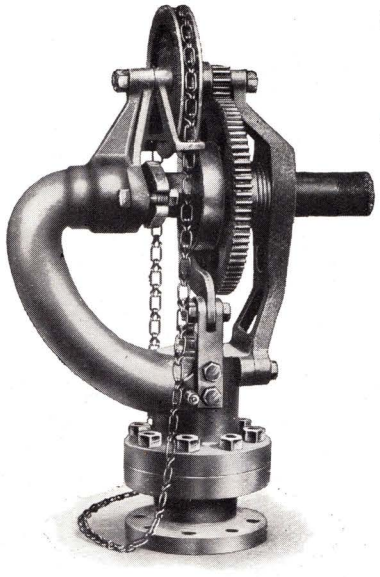
The centrifugal action set up throws the heavier dust particles towards the periphery, and they eventually strike against the lip covering a vertical slot which extends for the full depth of the volute casing. From this slot the grits are discharged to an external pocket which connects with the collector proper. The main volume of the gases passes from the separator through suitable openings in the chimney, these openings being so designed that a substantial volume of gases containing dust which has not already passed to the collector may recirculate in order that a maximum extraction of grit is eventually obtained. From actual laboratory tests, as high a percentage as 96% of dust inserted in the flow of the gases has been recovered, and from actual records taken at a London Power Plant nearly 700 lbs. of dust has been recovered by a collector during an eight hours run.

These Dust Catchers can be readily installed with all types of new boilers where steel chimneys are supplied, and for existing installations where steel chimneys may not be installed a special type of separator can be put forward.



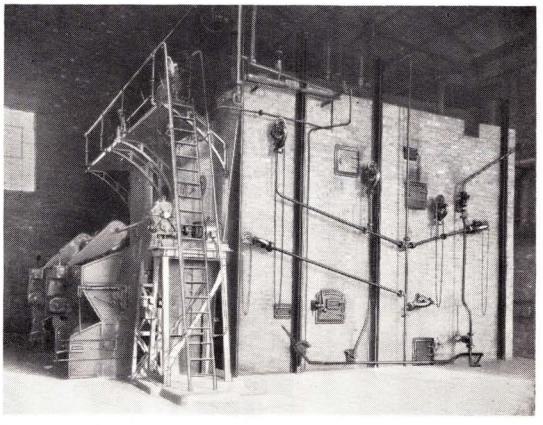
PATENT FLUE DUST COLLECTOR, "S.P." TYPE, APPLIED TO A STEEL CHIMNEY.

CALORIZED DIAMOND SOOT BLOWERS



CALORIZED DIAMOND SOOT BLOWER HEAD WITH STEEL VALVE BOX. STANDARD G9A VALVE-IN-HEAD TYPE.

THE INCREASE IN THE SIZE OF BOILER UNITS, and generally the lack of space required to keep boilers satisfactorily cleaned with the ordinary steam lance, has rendered necessary the use of Mechanical Soot Blowers.

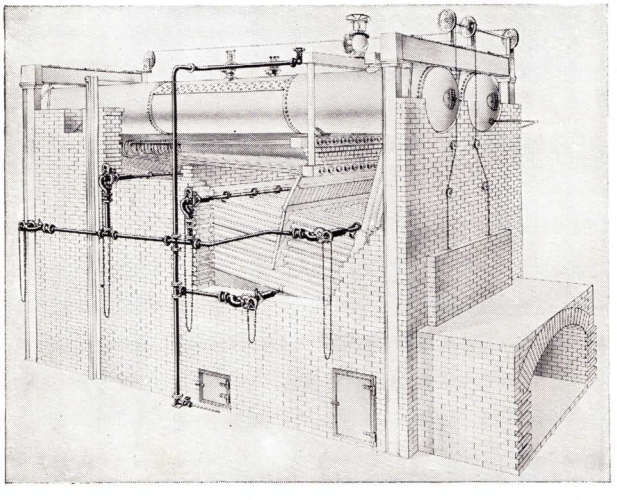


TWO BABCOCK & WILCOX BOILERS (W.I.F. TYPE) FITTED WITH SOOT BLOWERS.

This equipment is now available in the Calorized Diamond Soot Blower, which is being increasingly installed, having proved itself a practical appliance, costing very little for upkeep and effecting an annual saving in fuel consumption calculated at from 4% to 8%.

The arrangement of the soot blower consists of inserting a number of permanent pipes at right angles to the boiler tubes, and in such a position that the steam jets will completely cover the boiler tube area.

These tubes are fitted with specially formed Venturi-type nozzles, equally spaced between each pair of tubes on the outside of the boiler, and attached to each side of the blower tube is a special connecting head, so constructed that the blower tubes can be completely revolved by means of a chain operated from the boiler floor or galleries. Permanent steam pipe connections are made to each blower head and coupled direct to the steam main.

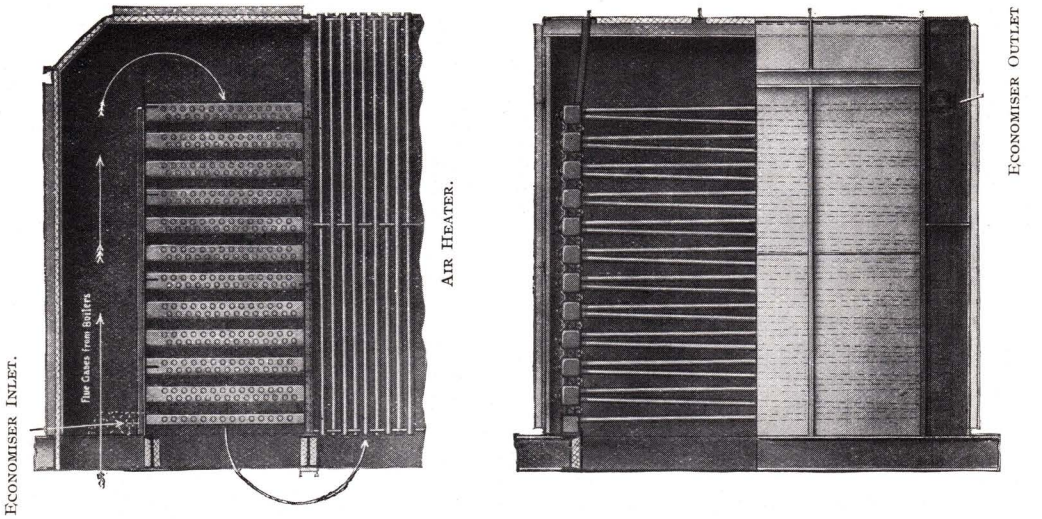


APPLICATION OF CALORIZED DIAMOND SOOT BLOWERS TO BABCOCK & WILCOX W.I.F. TYPE BOILER WITH SUPERHEATER.

When " sooting " the boiler it is only necessary to open the main valves admitting steam to the blowers and rotate the head by the chain controlling each wheel. The whole operation occupies less than a minute for each blower, and can be carried out when the boiler is in full operation.

For further particulars see our separate Pamphlet.

CONTRA-FLOW ECONOMISERS



THE object of an economiser is to utilise waste heat from a boiler over and above the amount required to create the necessary chimney draught, and is effected by placing the economiser in the path of the gases after they have done their work amongst the boiler and superheater tubes. The fresh water is pumped through the economiser on its way to the boiler, whilst the hot gases coming from the boiler pass between the tubes in the economiser chamber on their way to the chimney; so, obviously, economisers represent a very important link in the steam generating plant, and in the case of high pressures the question of safety and reliability have to be very seriously considered.

Owing to the increase of steam pressures during recent years steel tube economisers, integral with the boiler unit, have become popular; but in using this metal the danger of corrosion had to be considered, with the result that the closed feed water system and treating the water with lime have been adopted, so that now from the large number of steel economisers installed the corrosion question need not trouble any engineer who is considering their adoption.

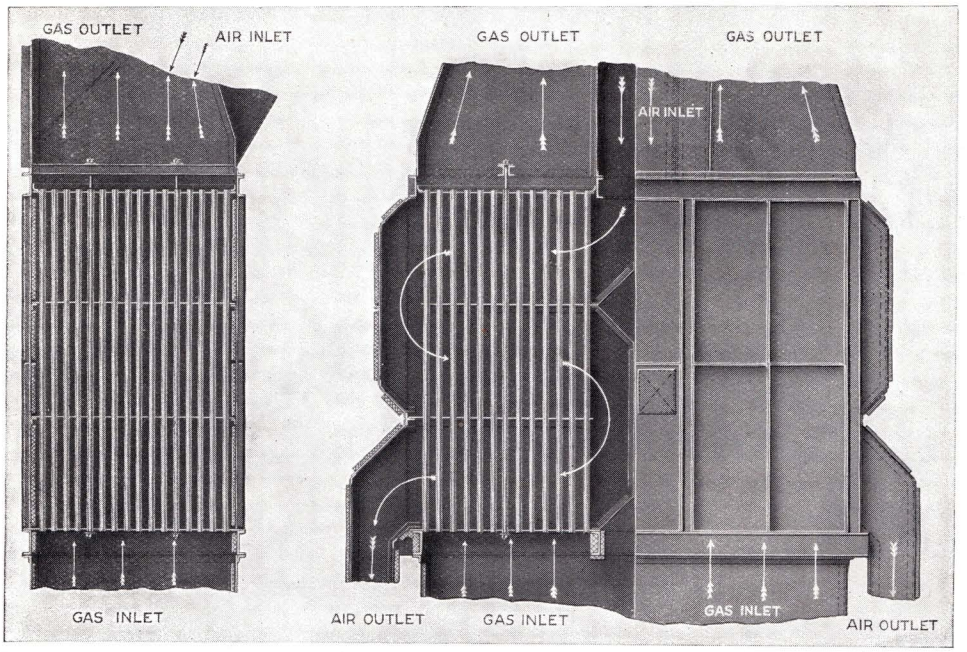
The most recent steel-tube economisers are designed to give relatively high gas and water velocities, and by employing a strictly contra-flow of gas and water high economiser efficiencies are obtained.

The contra-flow type of economiser developed by Babcock & Wilcox, and illustrated above, is representative of the modern steel tube type. This economiser is made up of forged steel boxes and straight tubes. The water is led to the lowest box at one side of the economiser where it passes through a single row of tubes to the lowest box on the other side, thence it passes to the second box on the inlet side through another single row of tubes, and successively in the same manner from bottom to top of the economiser, at which point it is fed into the boiler.

The upward flowing water is met by the hot gases passing downward, thus ensuring a strictly contra-flow with the maximum rate of heat transfer.

Further particulars may be obtained on application.

AIR HEATERS



AIR HEATERS are installed for the purpose of utilising the heat in gases coming either directly from the boiler or from the economiser for heating the air used for combustion. They have been in common use in both marine and stationary practice for some time and the increasing fuel costs of the past few years have awakened considerable interest in this class of apparatus and, because of the higher efficiencies now required in steam raising plant, air heaters will undoubtedly be used to a greater extent than formerly.

Air heaters are of two general types: namely, tube and plate heaters. In the former the gases pass through the tubes and the air for combustion over them, while in the latter the air and gas pass through adjacent channels formed by plates.

These heaters are of special advantage from the standpoint of efficiency of combustion with low-grade fuels, when any increase in furnace temperature is of assistance in promoting the more rapid and complete combustion of the fuel.

It has to be borne in mind, however, that the effect of using hot air for combustion has a very considerable influence on furnace material generally, and to minimise the effect on brickwork special constructions are now frequently provided, notably the insertion of water-tubes into the furnace or brickwork of the furnace.

The Babcock & Wilcox Air Heater, illustrated above, is of the tube type, and over an extended period during which it has been installed has proved satisfactory, and has resulted in an increased boiler efficiency.

FEED-WATER HEATERS

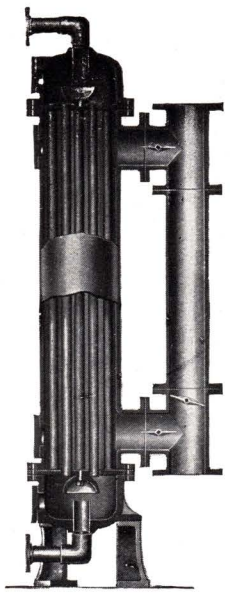


Fig. 1.
CAST-IRON SHELL.

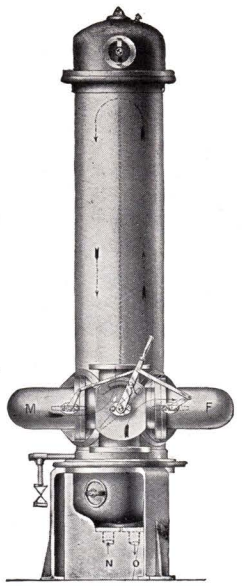


Fig. 2.

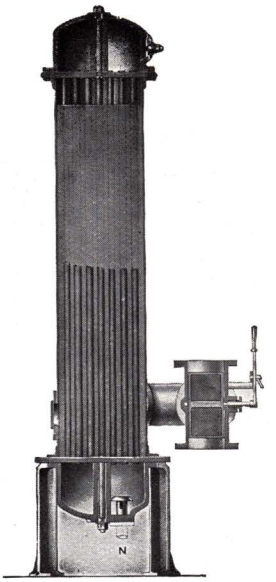


Fig. 3.
WROUGHT-IRON SHELL.

THE advantage of heating the feed-water before it enters the boiler is well-known, and generally it may be said that every ten degrees (Fahrenheit) of heat added to the temperature of the feed-water means a saving of one per cent. in fuel.

The illustrations above show an apparatus for use when the engines are non-condensing and consequently exhaust steam is available. Frequently less than the whole quantity of exhaust steam from an engine is sufficient for heating the feed-water of the boiler supplying it, thus allowing some of the exhaust steam to be used for other purposes ; if not required, of course it can all be passed through the heater.

Among the Points of Advantage possessed by the Babcock & Wilcox Feed-water Heater are the following:

The Heater may be disconnected for cleaning and examination, without stopping the engine, by diverting the exhaust steam through the bye-pass direct to the atmosphere. The atmospheric valve is opened and the heater valves closed by one movement of a lever.

May be arranged to work in either a vertical or horizontal position, and therefore can be introduced into an existing pipe system or made to suit the exigencies of space with the least possible expense in piping.

Can be made in parts not exceeding 3 cwts., for convenience of transportation.

The water passes through the interior of the tubes, taking advantage of the fact that tubes are stronger to resist internal than external pressure, and by the removal of the top and bottom water chambers the tubes can be easily inspected and cleaned.

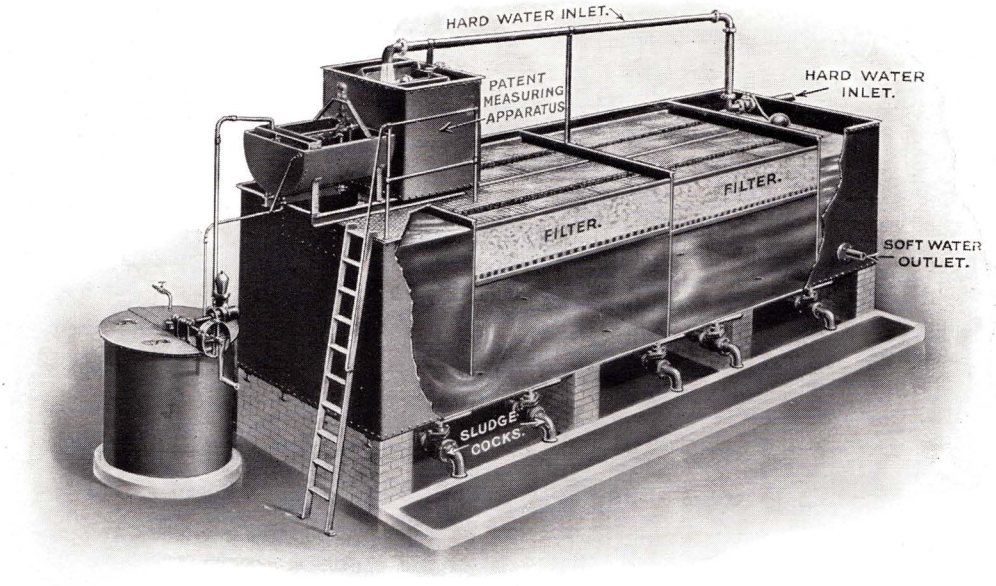
Ample area is allowed for the passage of the steam so as to avoid back pressure on the engine.

There is no contact between the water and the steam, and consequently the danger of grease from the engine getting into the feed-water is avoided.

The water and steam are caused to circulate in the heater so that the former absorbs the waste heat of the latter to the utmost extent.

For further particulars see separate Circular.

WATER SOFTENERS



SQUARE TYPE OF SOFTENER (LASSEN-HJORT SYSTEM), WITH CHEMICAL MIXING TANK.

ADVANTAGES:

Automatic in working. Occupies small space. Cost of attendance small. Simplicity. Reliability. Perfect admixture of chemicals and water. Requires little attention.

THIS WATER SOFTENER has been designed for the purpose of removing, by chemical means, the scale-forming matter from water prior to its use, thereby preventing damage to boilers, etc., from the accumulation of incrustation, at the same time effecting a large saving in fuel consumption by keeping all parts of the boiler heating surface in a clean and thoroughly efficient condition.

The Water Softener is extremely simple in its working, and the arrangement for mixing the chemical reagents with the water insures most reliable results. The apparatus works quite automatically, the supply of water to the Softener being regulated by a float valve, and the chemicals being added by a Patent Automatic Measurer.

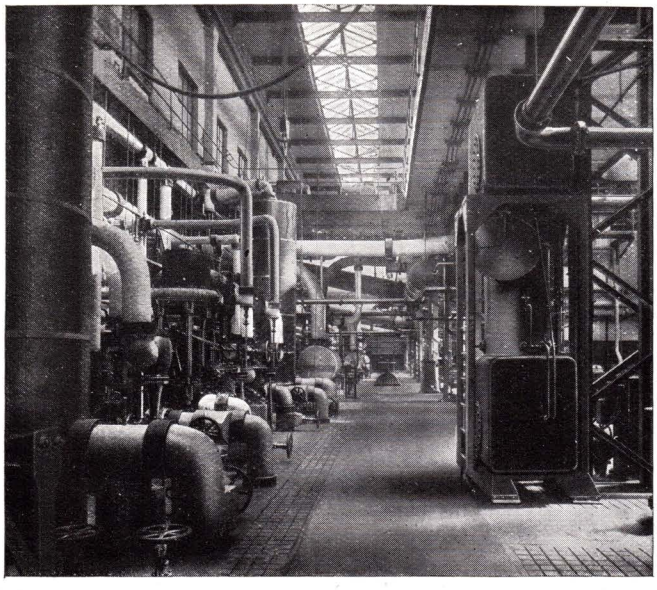
The reagents are conveniently prepared at ground level in the mixing tank and lifted by the pump to the chemical retainer.

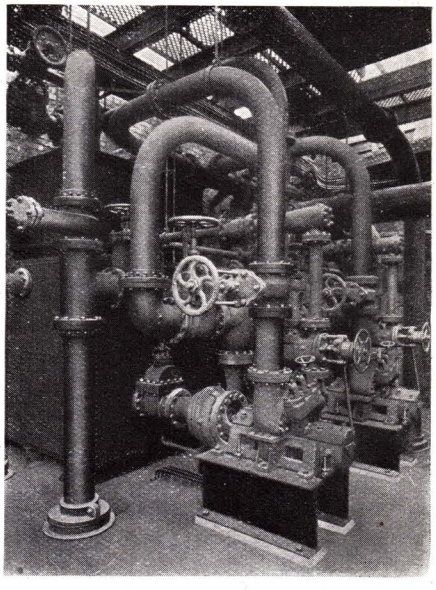
If a supply of exhaust steam be available it can be utilised for heating the water, thereby shortening the time of treatment, enabling a smaller apparatus to be used for a given quantity of water softened, and making the plant a combined Water Softener and Feed-Water Heater. If no steam be available, however, water can be equally treated in the cold.

Over **10,000** of these Softeners are now in use all over the world in various industries.

In order to prevent boiler corrosion it is essential that the feed-water and the boiler-water should be made and kept alkaline. To enable engineers to do this, and to ensure this condition of boiler feed, Babcock & Wilcox supply ALKALINITY TESTING SETS, with instructions for their use, full particulars of which are obtainable on application.

For further particulars see separate Circulars.





VIEWS OF HIGH PRESSURE STEAM AND WATER PIPING INSTALLED BY BABCOCK & WILCOX, LTD.

A SPECIALITY IS MADE OF PIPING WORK, and a very considerable number of complete installations of Steam, Exhaust, Feed, and other Piping, including the usual incidental accessories, have been carried out for the principal corporations, local authorities and private firms in the United Kingdom and abroad.

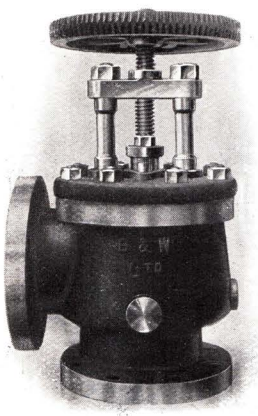
Separate Shops, fitted with the newest machinery, most of it specially designed, have been put down at Renfrew for handling Pipework expeditiously and economically.

Steam Pipes up to sixteen inches diameter are now supplied by Babcock & Wilcox of Weldless Mild Steel, and are designed for the limits of pressure recommended by the British Standards Committee. The Flanges are of Wrought Mild Steel, pressed out of the solid.

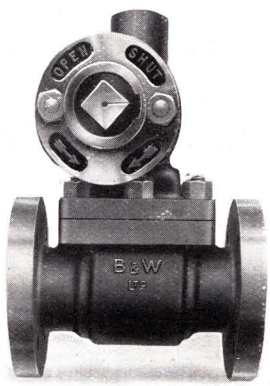
In addition to the equipment of a large number of Central Electricity Works, Piping Installations for many industrial and other plants have been carried out.

The limit of pressure recommended by the British Engineering Standards Association, in their report No. 10, Part 2, 1926, have been adopted, and accordingly the high pressure pipework and accessories have been re-designed for the new limiting pressures of 250 lbs., 350 lbs., and 450 lbs. per square inch, respectively. Pipework for much higher pressures is also manufactured, and designs and quotations prepared and submitted for pipework to suit any pressures and requirements.

HIGH PRESSURE STEAM VALVES



ANGLE STEAM STOP VALVE.



PARALLEL SLIDE BLOW-OFF VALVE.

THE STEAM VALVES OF BABCOCK & WILCOX have been specially designed to meet the requirements of modern steam power plants. Special shops for their manufacture have been equipped with the most modern machinery, and only the very best materials and workmanship are used in their construction.

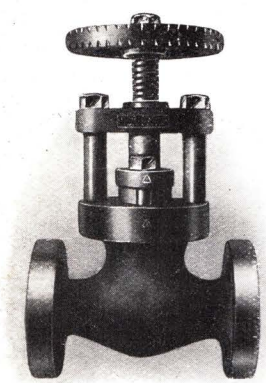
The series include parallel slide steam stop valves, angle steam stop valves, single and double spring safety valves, and small gun-metal and cast-steel globe valves.

All valves have a high factor of safety and are designed for high pressures.

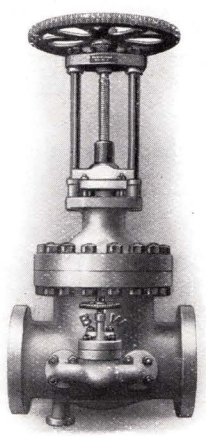
Although these valves are primarily designed for steam pressures they are equally suitable for water, and when required for this purpose are fitted with gun-metal working parts.

Babcock & Wilcox also manufacture and supply Parallel Slide and Angle Valves with Wrought Steel Bodies suitable for the highest pressures.

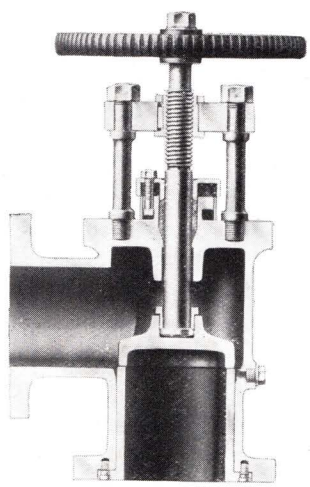
Particulars and Catalogues illustrating and describing the above valves may be obtained on application.



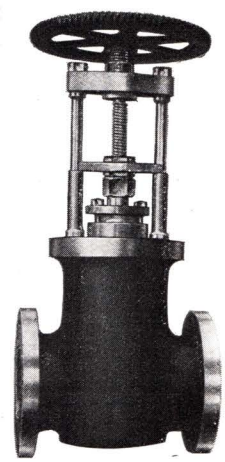
SMALL GLOBE VALVES WITH FORGED STEEL BODIES, FOR PRESSURES UP TO 450 LBS. PER SQ. IN.



PARALLEL SLIDE STEAM STOP VALVE, WITH BYE-PASS, FOR PRESSURES ABOVE 450 LBS. PER SQ. IN.



WROUGHT STEEL ANGLE VALVE.

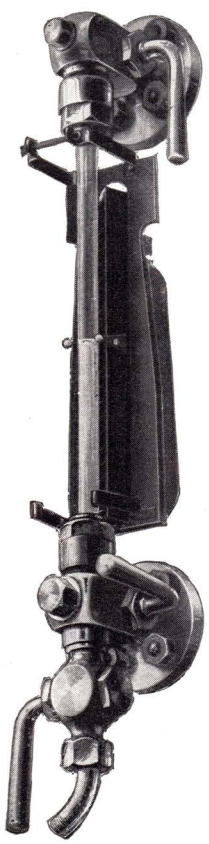


WROUGHT STEEL PARALLEL SLIDE VALVE.

ILLUMINATING WATER GAUGE FITTING

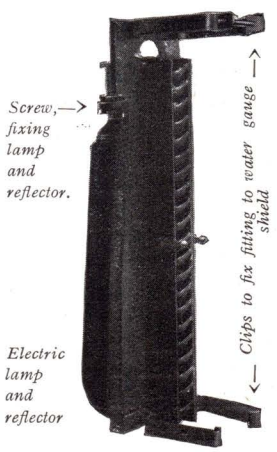
Patented in Great Britain ; also protected in foreign countries.
Patent No. 211,362.

IN MODERN GENERATING STATIONS, to meet the steadily growing demand for electric power, steam units of large capacity are frequently installed, involving considerable increase in the height of the steam and water drum above the firing level.



ILLUMINATING WATER GAUGE FITTING, ATTACHED TO WATER GAUGE COLUMN, WITH GLASS SHIELDS REMOVED SHOWING LOUVRE AND LAMP REFLECTOR.

To facilitate seeing the water level, Babcock & Wilcox Ltd. have introduced an Illuminating Fitting, illustrated opposite, by which the light rays of an ordinary electric lamp are collected and reflected on to the gauge glass in such a manner that the top of the column of water, or meniscus, is brilliantly illuminated, thus very clearly showing up the level or fluctuation of the water in the gauge glass.



VIEW OF ILLUMINATING WATER GAUGE FITTING.

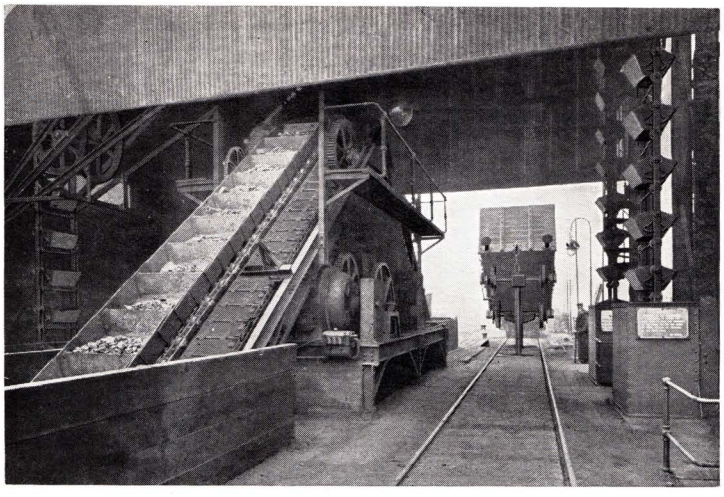
The bright meniscus shows up brilliantly under all conditions for the full length of the water column. There is also an arrangement whereby the working level is indicated by an illuminated red signal which shows clearly and accurately how near the water level is to mid-glass under all conditions of working.

The fitting can be attached to or removed from the water column in a few seconds, and is not damaged when a gauge glass breaks.

The device is applicable to the plate glass transparent type of water level indicator which is favoured by many engineers when the working pressure is above the normal.

Prices and further particulars can be obtained on application.

PATENT SILENT GRAVITY BUCKET & TRAY CONVEYORS



VIEW OF GRAVITY BUCKET AND TIPPING TRAY CONVEYORS AND WAGON DISCHARGE BY TIPPING RAMS, SUPPLIED BY BABCOCK & WILCOX TO A MIDLAND GAS WORKS.

THE BABCOCK & WILCOX GRAVITY BUCKET AND TRAY CONVEYORS have many distinguishing features :—

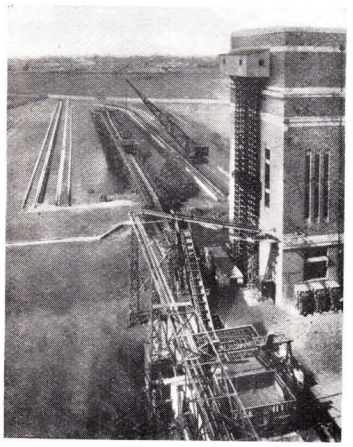
1. All parts are of mild steel, excepting the wheels which are in hard cast iron, thus eliminating chance of undetected flaws inherent to castings. The importance of this is obvious in material in tension such as a conveyor chain.
2. Buckets are pressed out of a solid sheet, being lighter, stronger and more durable than built buckets. There are no joints for rust to accumulate between, or rivets to fall out.
3. The conveyor chains are of the bushed pattern, all wear being taken up upon a renewable bush which can be taken out and renewed without removing a link.
4. The buckets and trays can be removed by taking out two split pins, there being no necessity to disturb the chain.
5. The material, after its delivery to the gravity bucket or tray conveyors, is carried to its destination and is not disturbed or shaken on the way.
6. The whole machine is carried on wheels and every part is thoroughly lubricated.
7. Change of direction is effected by running the chain around large diameter wheel curves instead of stationary curve tracks.
8. The Conveyors move slowly (45 to 60 feet per minute), the capacity being obtained by the size of buckets or trays.
9. The cost of maintenance, power and labour is less than any other kind of conveyor.
10. The power required to operate is low.
11. The machines are noiseless in operation.
12. The Gravity Bucket Conveyors are made in standard sizes, 20, 40, 60, 80 and 100 tons of coal per hour.
13. The Tray Conveyors are made in standard sizes, 20, 40, 60, 80, and 100 tons per hour. Two types of Tray Conveyor are manufactured :—
    (*a*) Patent Tipping Tray Conveyor to handle up to sizes of 4-in. to 6-in. cubes and discharge at any point.
    (*b*) For over-end delivery, dealing with the largest size of lump coal, the trays forming a moving steel trough.

PATENT CONVEYORS

Belt Conveyors.

BABCOCK & WILCOX BELT CONVEYORS are manufactured in capacities up to 1,000 tons per hour. Mechanical parts are designed from experience and are the latest practice, having five-pulley troughed idlers with plain, roller, or ball-bearings, as required.

Other Types of Conveyors.

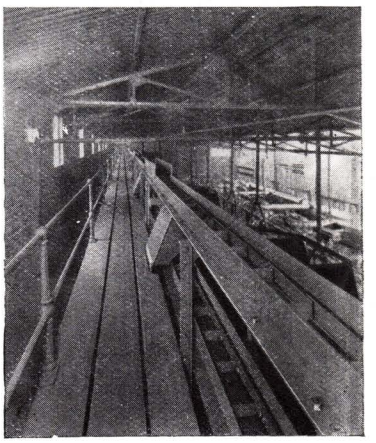


COALING EQUIPMENT OF GRAVITY BUCKET, TRAY AND BELT CONVEYORS, CRANE AND WAGON TIPPLER.

Babcock & Wilcox manufacture Push-plate, Scraper, Drag-link, Bucket Elevator (open type) totally enclosed Slat Conveyors for carrying cases, and many other types.

Standardisation.

All parts for Babcock & Wilcox manufactures outlined above are standardised, made to jig and template, and are interchangeable so that replace or extension parts can be supplied either from stock or at shortest notice.

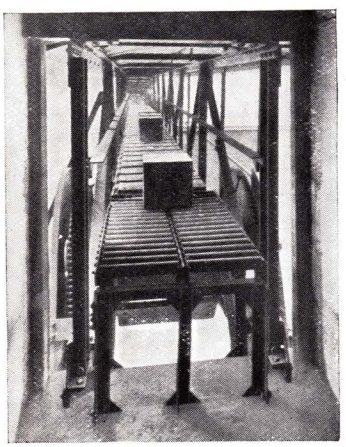


U-LINK CONVEYOR AT AN EASTERN COUNTY SUGAR BEET FACTORY.

Coal Breakers.

We standardise four-roll, two-roll and single-roll Coal Breakers up to 100 tons capacity per hour.

Wagon Discharging Devices.



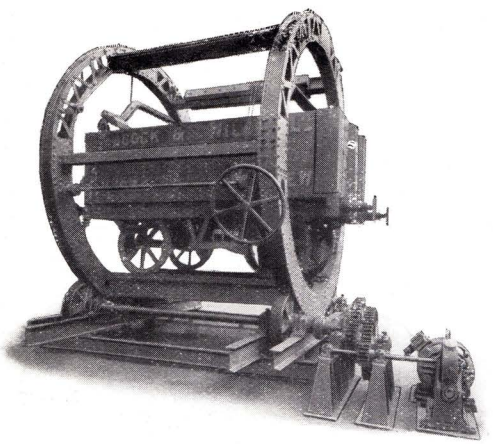
SLAT CONVEYOR, BERMONDSEY COLD STORAGE.

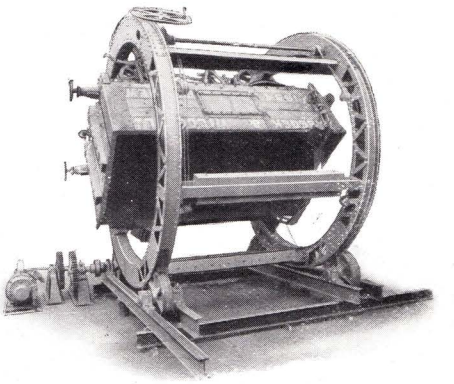
We manufacture Ram Tippers (Electric and Hydraulic) and Overhead Hoists for tipping and emptying railway wagons; also Hand, Automatic and Mechanically clamped Rotary and Side Tipplers.

We have made a special study of the production of material of this character and are always pleased to prepare schemes and drawings to meet any particular requirements.

COAL ELEVATOR AT AN ELECTRICITY WORKS.

ELECTRIC TIPPLERS





RAPID DISCHARGE OF RAILWAY WAGONS, containing coal or minerals in bulk, with the least possible delay is to-day recognised as a necessity. The Rotary Tippler, illustrated above, meets this requirement, as any class of truck, whether fitted with end opening or side opening doors, can be inverted and discharged in the minimum amount of time.

Further, there are some classes of material which it is impossible to discharge from wagons unless they are overturned, and in these cases it is preferable to apply a Rotary Tippler instead of end tipping gear, which usually elevates one end of the wagon until it probably inclines at a maximum but insufficient angle to effect complete discharge.

The BABCOCK & WILCOX ELECTRIC ROTARY TIPPLER for railway wagons, illustrated above, consists essentially of a cylindrical frame carrying a short length of rail track on to which a wagon can be run and quickly secured by special locking screws and cross bars.

The method of operation is as follows :—The Tippler is brought to rest when the rails which it carries are in correct alignment with the permanent rails, by the application of a stop attached to the circular path of the frame. The cross bars binding the wagons to the rails are lowered (or raised) by means of a single hand-wheel operating through worm gear shafting and wire ropes and the links, binding screws, etc., attached. Initially the load in the wagons partially compresses the wagon springs, so that the binding screws are applied with only a light tension. When the truck is secured in position the motor actuating the gear is started, and the train of gear finally operating the wheels carrying the Tippler revolves, the friction between the surfaces being sufficient to move the wagon until it is tilted to any angle required, or to an inverted position.

To bring the wagon back from this position into correct alignment with the main rails the motor is reversed.

The Tippler is strongly made of mild steel channels and plates, the rings being built up in segments ; the longitudinal tie-beams are also of mild steel and strongly connected to the rings at the junctions.

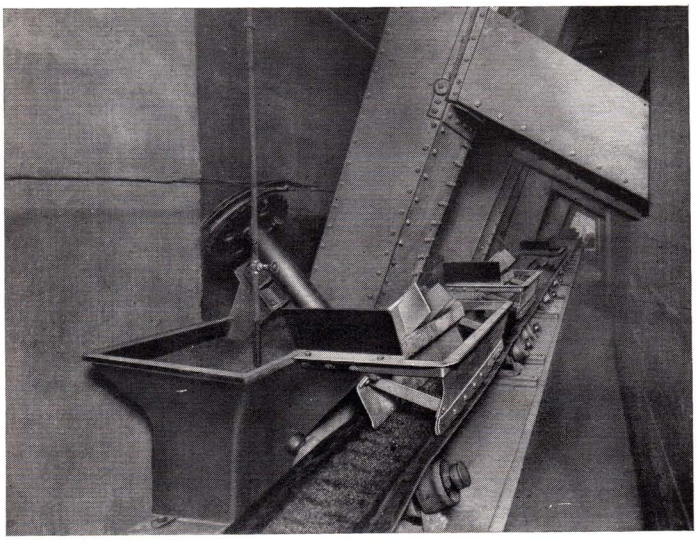
Six wagons can be dealt with per hour by the Tippler, when fitted with hand clamping gear, provided they are handled to and from the Tippler sufficiently quickly, but the capacity of the Tippler can be increased up to 12 or more trucks per hour by the application of mechanically operated clamping gear. The clamping can be effected mechanically by the most convenient power available: viz., electrically, hydraulically or pneumatically.

The Tipplers are manufactured in three standard sizes suitable for dealing with trucks up to 12, 15 and 20 tons nett capacity.

A 5 h.p. Motor is sufficient to operate the 12 tons size, the power required for the greater weights being proportionate.

The Tipplers are not suited for the passage of a locomotive or covered wagon.

PATENT ASH EXTRACTOR PLANT



ASH EXTRACTOR PLANT AT A SOUTH EASTERN PAPER MILL.

HERE is illustrated a PATENT CONTINUOUS ASH EXTRACTOR PLANT which over extended tests of some years has given complete satisfaction.

The general arrangement is that each boiler would be fitted with a chute leading to and immersed in water contained in a cast iron tank, the ashes falling down the chute into the water.

For mechanically extracting the ash a cast iron wheel, inclined to the vertical about 45°, mounted on a spindle and having vanes on the periphery, and rotating it at a speed of about 45 revs. per hour, lifts the ashes from the bottom of the tank, and discharges them at the highest point of the wheel over the edge of the tank.

The wheel in the tank is carried clear of the bottom so that there is no rubbing surface below water in contact with the ash, the inclined shaft to which it is attached being supported in a long sleeve bearing fitted with a thrust washer carried above the tank, none of the wearing parts being in contact with water and ash.

An outlet, separate from the outlet for the refuse, and situated on the opposite side of the tank, is provided for overflow water.

The ashes, which, owing to the slow movement of the wheel, have time to separate from the bulk of the water, and delivered from each tank, fall on to a continuously running belt conveyor, operating transversely to the rear of the stokers, which removes the ash to the end of the boiler house.

The belt conveyor consists of a 5×4 ply cotton belt, 16″ wide, impregnated with rubber and having a solid rubber face $\frac{1}{8}$″ thick in centre, supported on suitable troughing and return idlers, and operating at a speed of 150′ per minute, a suitable tension gear being provided at the end remote from the delivery point.

The driving gear of the belt conveyor consists of a motor and worm reduction gear with chain drive to countershaft; the same driving gear also operates a crank disc mounted on a shaft, the crank pin being connected by wire rope to the ratchet and pawl mechanism carried on the shaft of each revolving ash wheel. The reciprocating motion thus imparted to the wire rope connecting the driving gear to the shafts of the ash wheels causes the wheels to revolve at the desired speed.

A balance weight at the end, remote from the driving gear, causes the actuating rope to travel on the return stroke, the wheels being caused to rotate due to the pull on the crank pin and connections.

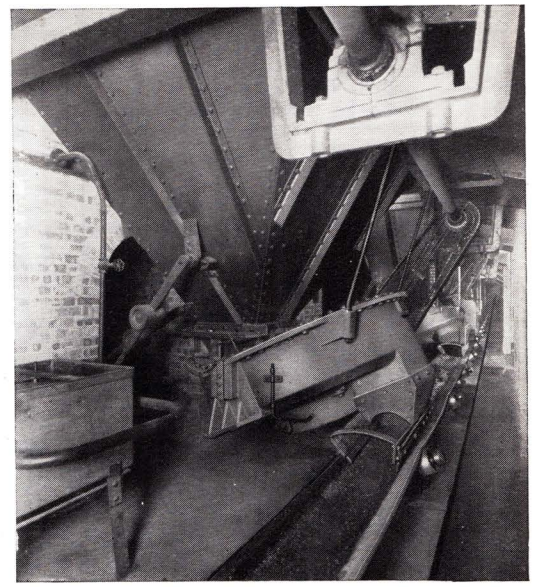
ASH EXTRACTOR PLANT

AN ALTERNATIVE DESIGN of Ash Extractor Plant, on the same principle as described on the opposite page, can be provided to suit varying conditions at site.

This plant is worm-driven and manufactured in two different sizes, being standardised for small ash particles and for large slag pieces.

The water level in the ash extractor pans is controlled by a special regulating device taking its supply from any low pressure water service.

The driving gear is of the simplest nature, each extractor tank being driven by a worm and worm wheel. The drive is most conveniently taken from a continuously operating line shaft by means of a chain drive, or can be arranged so that each boiler has its own drive.



ASH EXTRACTOR PLANT AT AN EASTERN COUNTY SUGAR BEET FACTORY.

Under each of the spaces from which dust is to be removed a cast iron collecting box can be fitted. These boxes are connected by pipes to the main ash extractor casing.

On the main extractor casing a special flooding cock can be fitted, connected to ejector nozzles in the collecting boxes and taking its water supply from low pressure service mains.

By a suitable attachment the rotating of the main ash extractor periodically opens the cock, allowing water to pass to the ejectors in the ash boxes ; the contents of the same being swept through the pipes into the main ash extractor tanks, from which the ash and wetted dust are removed by the revolving paddle.

The ashes discharged from the extractors can be delivered to a continuously running belt conveyor, as shown in the illustration, taking the ashes outside the boiler house, so that the process is automatic ; or, if desired, the material can be discharged to ash wagons operating in the basement.

It will be noted from the foregoing descriptions that this type of plant offers great advantages over a scraper conveyor, in that all the bearing surfaces operate in oiled bearings instead of rubbing metal to metal in a mixture of ash and water, thus reducing wear and upkeep costs to a minimum. Further, by throwing out of action the pawl operating any individual wheel, that wheel can be put out of operation, only the moving parts therefore relative to the stokers actually at work remaining in motion.

PORT OF LONDON AUTHORITY.
82 BABCOCK & WILCOX 3-TON ELECTRIC PORTAL CRANES FITTED WITH PATENT BALANCED LEVER-LUFFING JIBS.
Maximum radius 60 feet with 3 tons load, and 65 feet with 2¾ tons load.

THE BABCOCK & WILCOX PATENT LUFFING JIB CRANE, illustrated above, has been especially designed to increase the efficiency and sphere of usefulness of all jib cranes for handling cargo, either in the form of merchandise, or in bulk, as coal and ore.

The provision afforded for free and rapid luffing, or movement of the load to and from the crane, is an advantage of the greatest importance, ready recognition of this being shown by the large number of these Cranes ordered by Dock and Harbour Authorities.

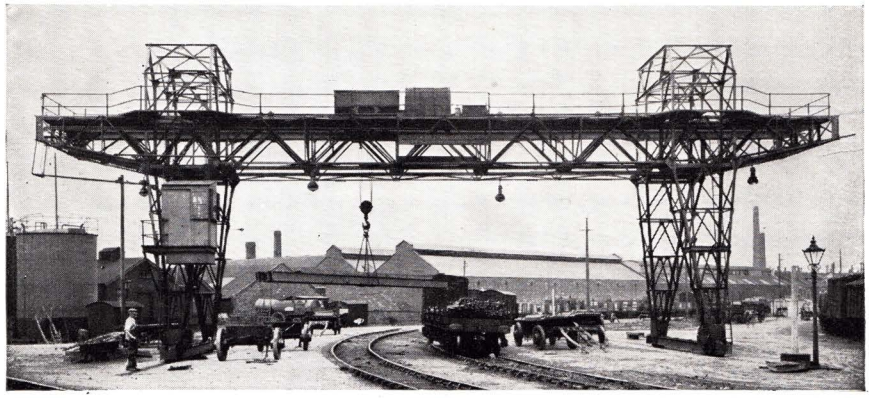
Babcock & Wilcox OVERHEAD CRANES for foundries, engineering shops, steel-works and railway yards, are in daily use throughout the world wherever exceptionable reliability, accuracy and efficiency are appreciated.

In addition to the foregoing we manufacture Electric Capstans and Winches, Grabs, and Wagon Tipping Plant, and Totally Enclosed Steam Winches for noiseless operation.

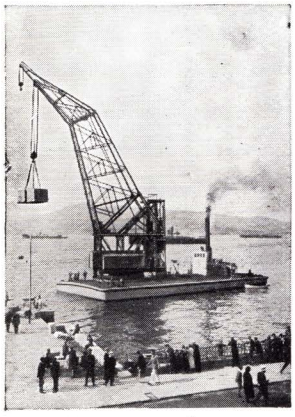
The views on the opposite page illustrate a variety of purposes for which Babcock Cranes have been installed, and the Norwich Electric Power Station Structural Steel Work and Telpher for handling coal is a particularly interesting example, while the Goliath Crane with Cantilever Arms shows the facility with which heavy railway goods may be handled.

Catalogues describing and illustrating more fully our activities in this direction may be obtained on application.

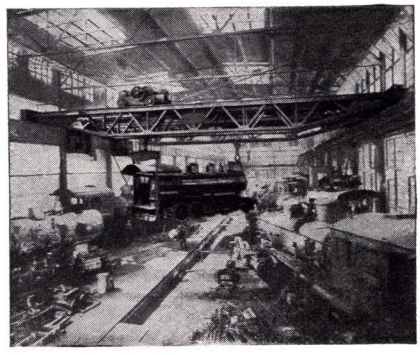
ELECTRIC CRANES AND TELPHERS



BABCOCK & WILCOX 12-TON ELECTRIC GOLIATH CRANE WITH CANTILEVER ARMS.
SPAN 60 FEET CENTRES OF RAILS. TOTAL TRAVERSE OF CRAB, 83 FEET.

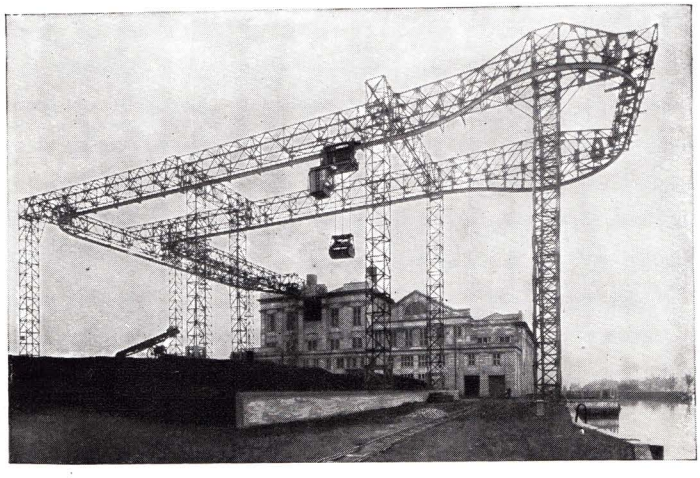


VIGO FLOATING CRANE.



BABCOCK & WILCOX
OVERHEAD TRAVELLING CRANE
IN A LOCOMOTIVE SHOP.

TWO BABCOCK & WILCOX COALING CRANES.

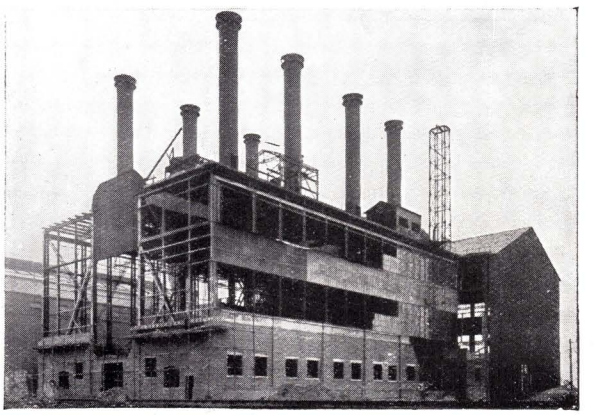


NORWICH ELECTRICITY WORKS. VIEW OF COAL HANDLING PLANT AND TELPHERS.

STRUCTURAL STEEL WORK

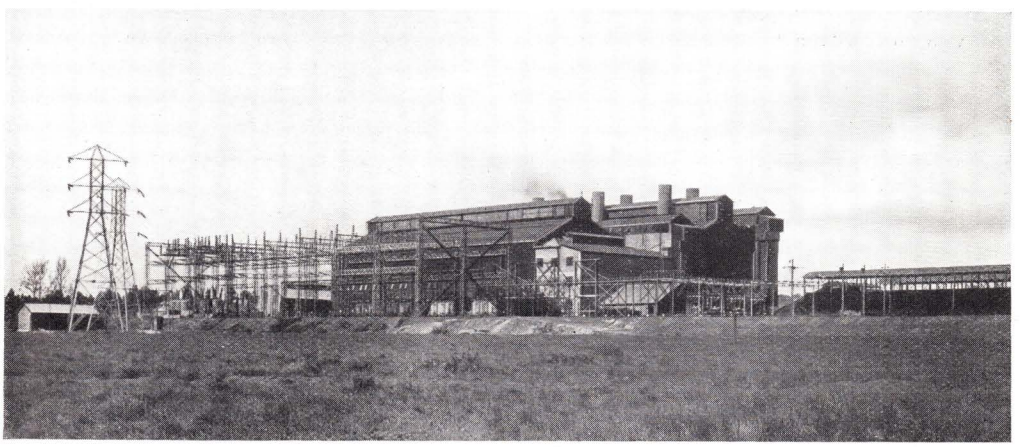
THE MANUFACTURE AND ERECTION OF STRUCTURAL STEEL WORK is extensively undertaken by Babcock & Wilcox Ltd., and contracts both in the United Kingdom and abroad have been executed in which the supplying of complete buildings, as well as complete equipment, have been successfully carried out.

The illustrations on this page comprise views of the North Tees Power Station and also the Power House of the Victoria Falls and Transvaal Power Co.,Ltd.,Witbank Generating Station, South Africa, and opposite a view of the Corporation of Liverpool Lister Drive Power Station, while on page 29 is shown an example of structural steel work and telphers in connection with the coal handling plant at the Norwich Electric Power Station, to mention a few of the contracts undertaken.

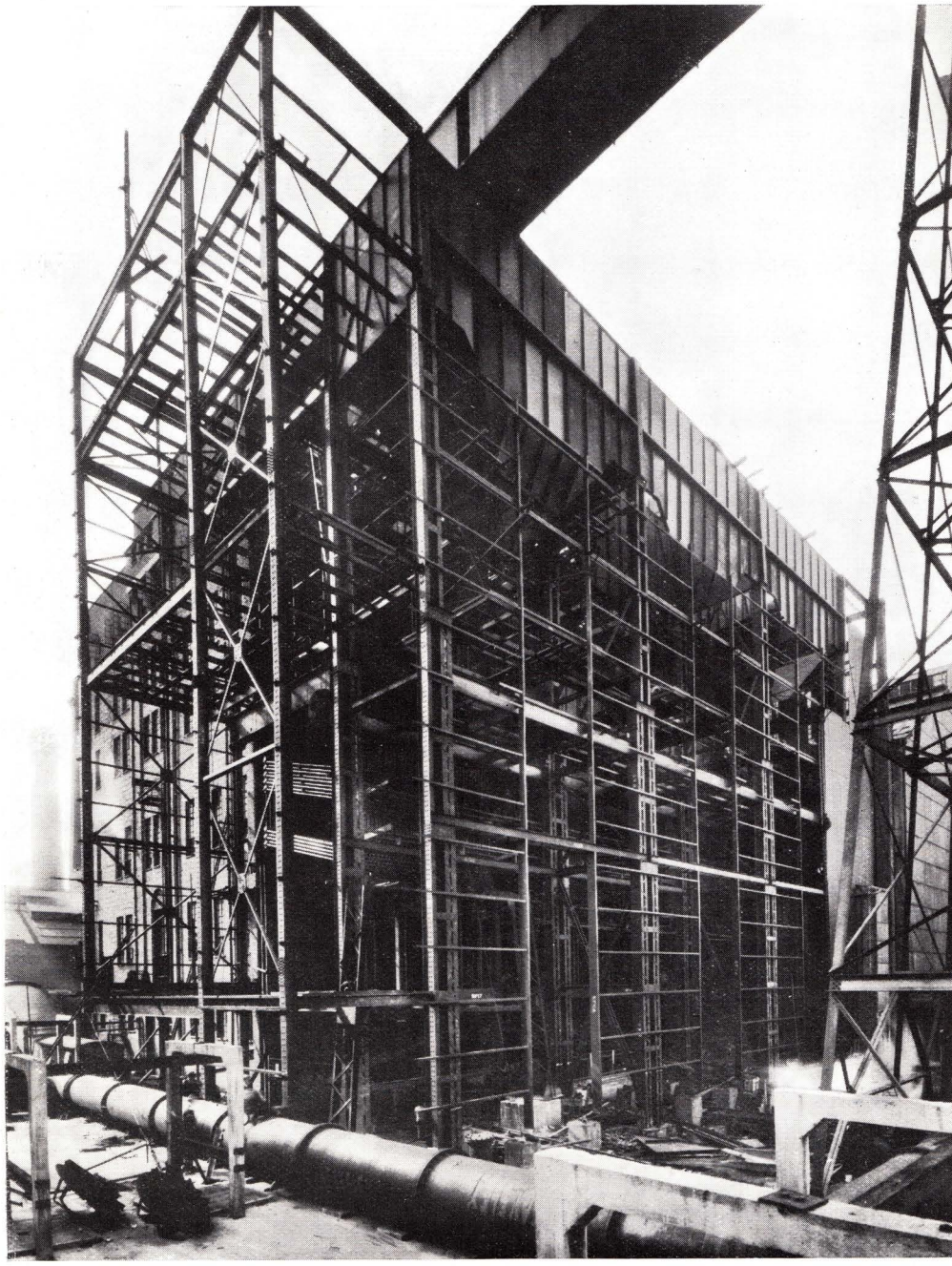


NORTH TEES POWER HOUSE UNDER CONSTRUCTION.

Enquiries for this class of work are cordially invited and clients placing their contracts with us have the advantage of the wide experience of expert structural engineers whose practical knowledge is at their disposal.



THE VICTORIA FALLS AND TRANSVAAL POWER CO., LTD., WITBANK GENERATING STATION, SOUTH AFRICA.
Babcock & Wilcox Ltd. constructed and supplied complete Engine Room and Boiler House, together with twelve L.T.M. Boilers, fitted with Superheaters, Stokers, Economisers, Pipework, Coal and Ash Handling Plant, etc.
View showing Plant in course of construction.
Order for Extension Contract since received.



CORPORATION OF LIVERPOOL LISTER DRIVE POWER STATION.
New Power House Buildings and Boilers, arranged for burning Powdered Fuel, supplied and erected by Babcock & Wilcox, Ltd.

BOILER SHOP—MAIN BAY.

THE LINCOLN WORKS OF BABCOCK & WILCOX LTD., which cover an area of about nine acres, are well equipped with modern machinery, both for special and general engineering work.

Standard Manufactures include Loco. Boilers, Steel Tanks, Pulverized Coal Plant, Totally Enclosed Steam Winches for Marine and Land use; Vertical Steam Engines, Stationary and Portable Crude Oil Engines, Calorizing Processes, etc.

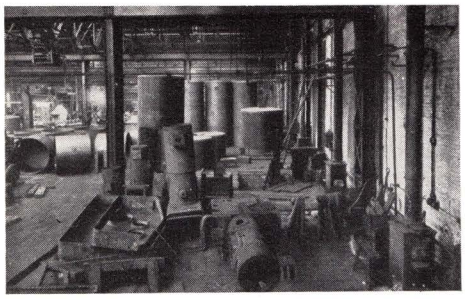
The Foundry contains Modern Moulding Machines for general Castings and Pipework, and the machine shops are available for all classes of general work.

Special Machines are installed for rolling Boiler Plates up to 1 inch in thickness and 30 feet in length, and the exceptional facilities for Presswork are a feature of the Works' equipment.

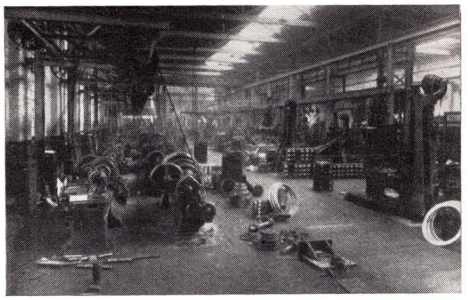
The following pages illustrate the extent of the Works and the wide scope and variety of manufactures undertaken.

Enquiries are cordially invited, and fuller details may be obtained on application

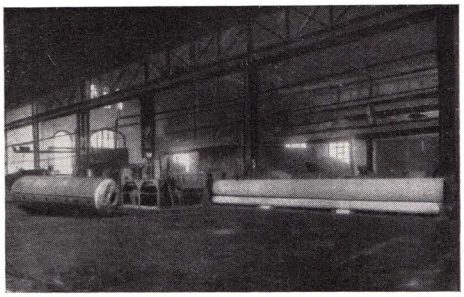
LINCOLN WORKS PRODUCTS



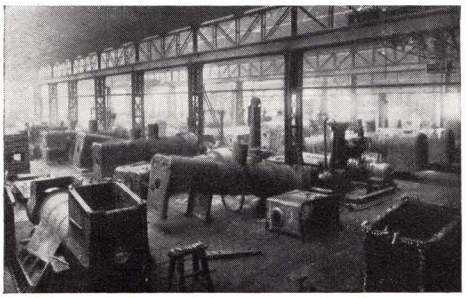
Boiler Shop Riveting Tower.



Machine Shop.



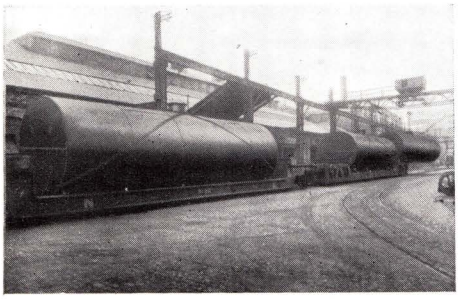
Heavy Rolls in Boiler Shop.



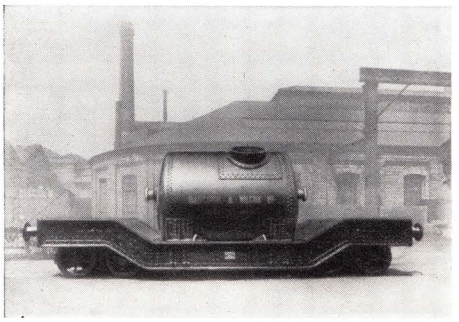
Locomotive-type Boilers in Boiler Shop.

General View in Iron Foundry.

Bay in Boiler Shop, showing 10-Ton Rail Tank Wagons.

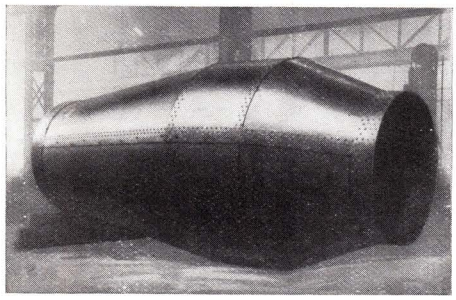


Oil Storage Tanks.

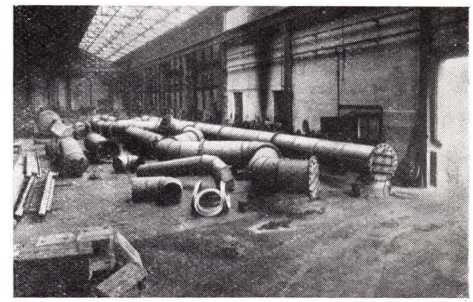


Steel Foundry Hot Metal Transport Ladle. Total Weight with Charge, 126 Tons.

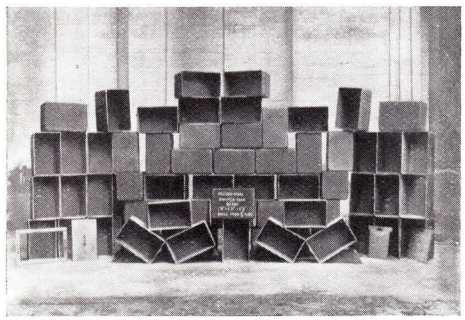
LINCOLN WORKS PRODUCTS



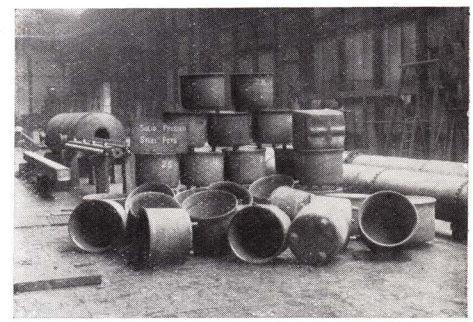
PART OF CEMENT KILN SECTION



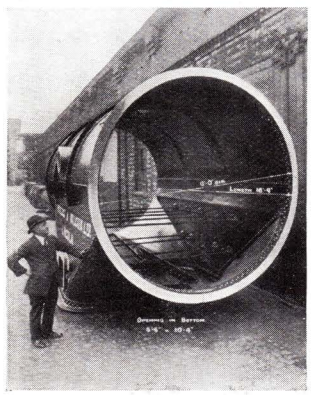
EXHAUST AND CIRCULATING WATER PIPES.



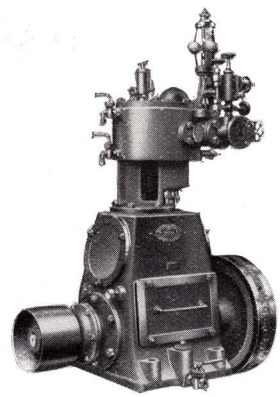
PRESSED STEEL SWITCH GEAR BOXES.



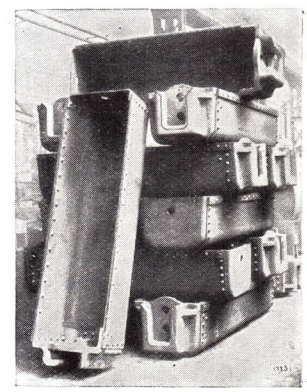
ANNEALING POTS.



CONDENSER SHELL



VERTICAL STEAM ENGINE.



CHARGING BOXES.

THE PROBLEM OF PREVENTING WASTAGE through the action of intense heat is of great importance to the manufacturing community, as the loss occasioned by this means is enormous.

The destructive action of heat presents no new metallurgical problem, and although from time to time various processes have been introduced for protecting metals against the corrosion due to acids and the atmosphere there is only one process in existence which gives protection against oxidisation and high temperatures—namely, that of Calorizing.

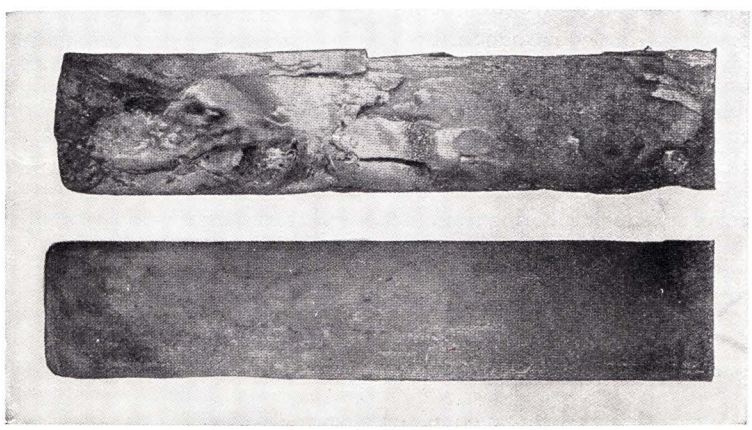
Under the very high temperatures which obtain in the common industrial heating operations, such as boiler furnaces, carbonizing, annealing and heat treatment processes, etc., all ordinary metals are found to scale or oxidize, in varying degree. For instance, wrought iron begins to oxidize at a dull red heat, about 1100° Fahr., and rapidly burns up when subjected to 1800° Fahr., and it may be said that the commercial development of a large number of processes is largely dependent upon the finding of a metal that will successfully withstand the continued application of high temperatures.

A number of alloys containing nickel or chromium have remarkable powers of resistance to high temperatures, but they are very expensive and generally prohibitive for the many commercial applications which may be covered by the relatively inexpensive process of calorization.

It is obvious that any process for the " fireproofing " of ordinary metals must be done with a protective surface coating, and to be satisfactory this non-oxidizable surface must be effected without altering the physical properties of the metal, or the shape or usefulness of the articles treated. Calorizing, which makes use of Aluminium as the protective metal, possesses these features in a marked degree.

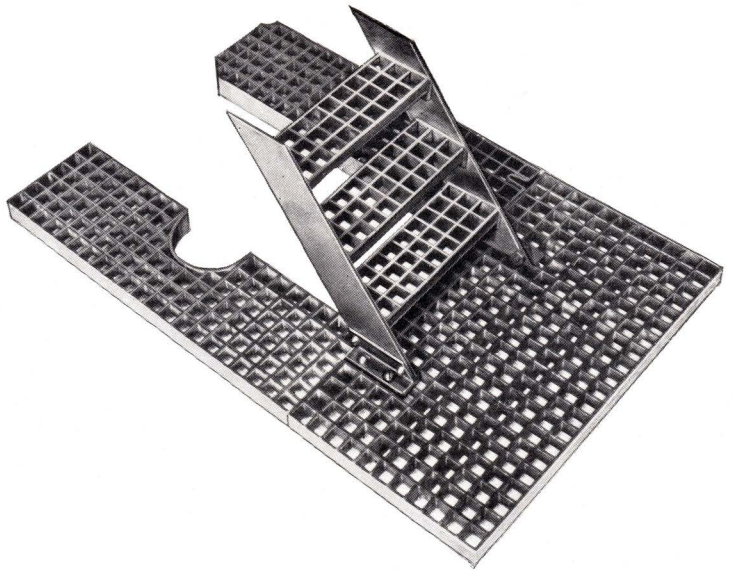
Broadly, the process of calorizing consists in the formation of a surface alloy of aluminium on ferrous and non-ferrous metals. The treatment so thoroughly infuses aluminium into the exposed portions of the metal being treated as to form a homogeneous alloy for a certain depth.

Briefly, it may be stated that calorizing consists in using relatively inexpensive metal, such as iron or steel, and covering it with a continuous protective alloy coating which becomes a homogeneous part of the metal treated, and is effected at a comparatively low cost.



The above illustration shews two pieces of extra heavy wrought iron pipe, one calorized and the other uncalorized, which were run side by side in a furnace at a temperature of 1500° Fahr. in an atmosphere of sulphur di-oxide for a period of four hours. At the end of this time the ordinary untreated pipe was badly burnt, as shown, while the calorized pipe appeared in all respects in as good condition as before.

Babcock & Wilcox Ltd. are manufacturers on behalf of the Calorizing Corporation of Great Britain, Ltd., and are in a position to quote for the calorization of all classes of furnace fittings, gas and oil engine parts, and other metallic articles.



INTERLOCK FLOORING, SHOWING ITS ADAPTABILITY FOR CURVES AND ANGLES, ETC.

THE BABCOCK & WILCOX PATENT INTERLOCK FLOORING is an all-steel grated flooring with the " life " of steel, and consists of a series of parallel steel bars placed on edge, these being slotted to the neutral axis. The cross-section bars are pressed in, thus forming a rectangular pattern with all top edges flush.

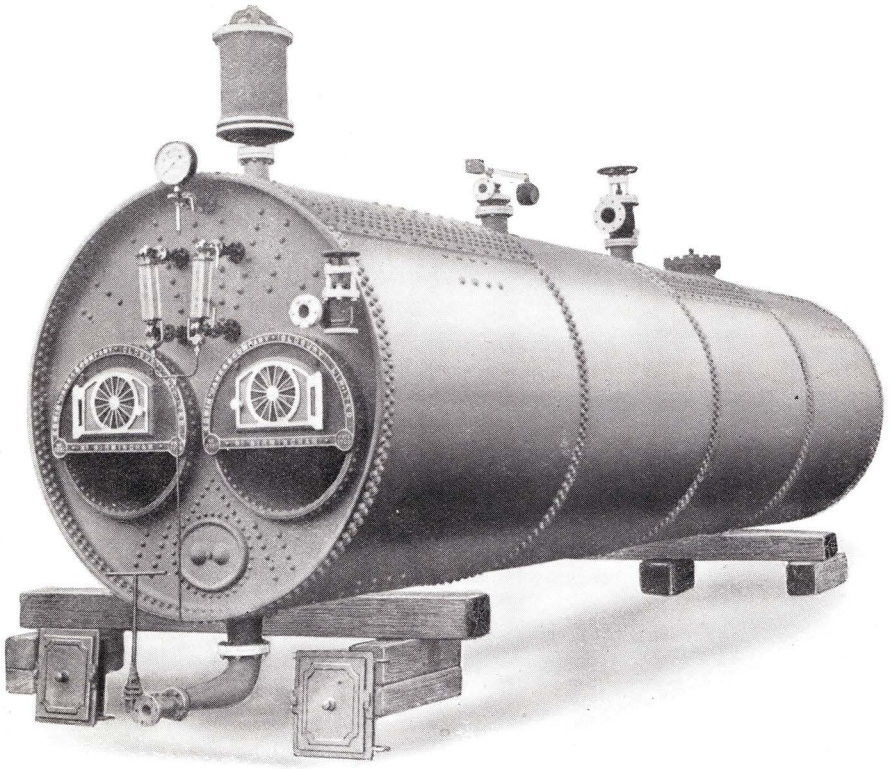
Each finished section is a light but inflexible panel embodying the well-known truss principles of engineering construction, by which a load applied at any point is distributed over a wide adjacent area, as no one member bears the load, which is shared by a number of adjacent members, and the full tensile strength of each member is applied in load resistance, because each member is supported at its top cord by the adjoining members. Maximum strength is thus secured with minimum weight of material.

Each panel of Interlock Flooring is, in fact, a solid unit : an air-cooled plate in which there is no looseness, rattling, warping, nor twisting.

Interlock Flooring cuts more easily than solid plate and is the only flooring manufactured with a complete surround which enables it to fit around pipes, columns, etc., without impairing the strength of the panel.

For many years it has been recognised that for galleries and platforms surrounding machinery, as well as for many other purposes, an open flooring freely admitting both light and air has many advantages, and the Interlock Flooring, illustrated above, which shows flooring of rectangular and circular types together with ladder, will be found to fulfil these conditions.

For further particulars see separate Catalogue.



IMPROVED FLANGED-ENDED LANCASHIRE BOILER.

THE OLDBURY WORKS OF BABCOCK & WILCOX LTD. are noted for the manufacture of High-class Cylindrical Boilers of every description, and extensive new shops with up-to-date machines have been recently added for the manufacture of all classes of steam raising and steam using appliances, also structural and other steel work relative thereto.

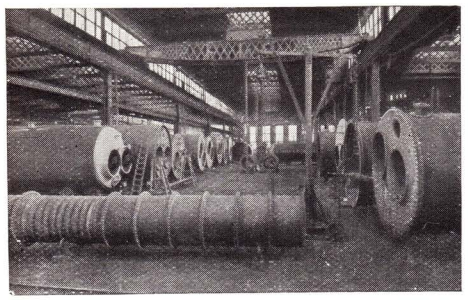
The high standard of workmanship and finish, exemplified over many years by the firms' Lancashire Boilers, has been extended to all new branches of construction, and prospective clients may confidently rely on this high standard being maintained.

In addition to Boilers, the manufactures include Annealing Pots, Bitumen Separators, Rubber Vulcanizers, Steel Tanks, Steel Chimneys and Ducts, etc., and enquiries are invited for steel work of every description.

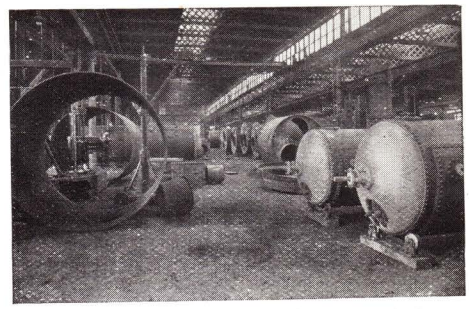
Every facility exists for handling Boiler Repairs promptly and effectively.

The illustrations on the following pages of the Oldbury shops and manufactures are an indication of the facilities available for giving rapid and effective service.

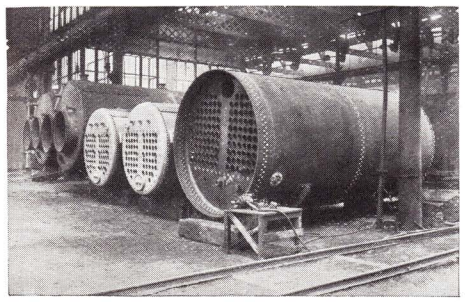
Enquiries are cordially invited and detailed catalogues may be obtained on application,



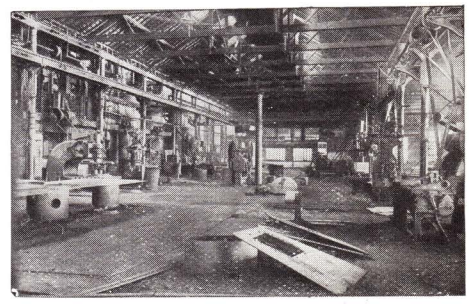
BOILER SHOP, LOOKING EAST.



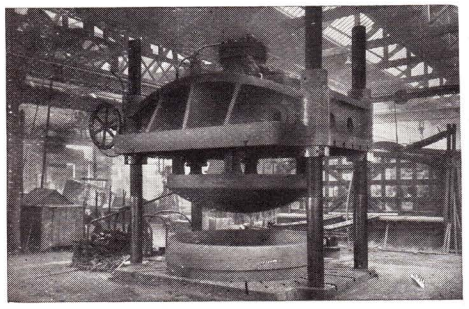
BOILER SHOP, LOOKING WEST.



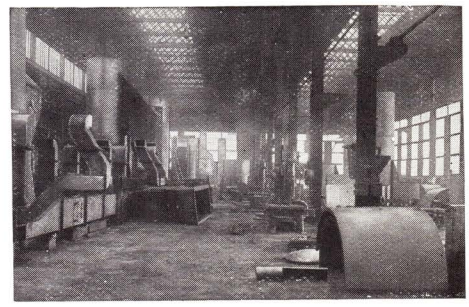
MULTITUBULAR AND LANCASHIRE BOILERS.



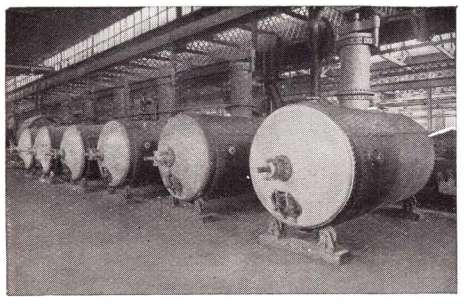
PLATING SHOP.



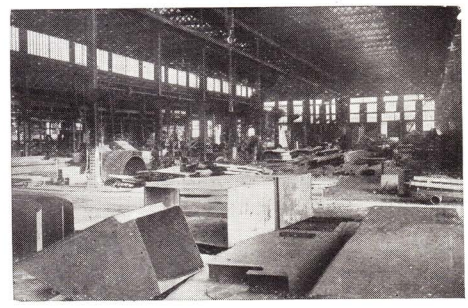
500-TON HYDRAULIC PRESS.



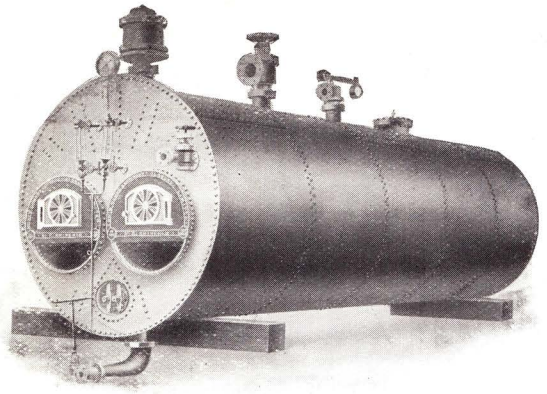
GENERAL VIEW OF STRUCTURAL SHOP.



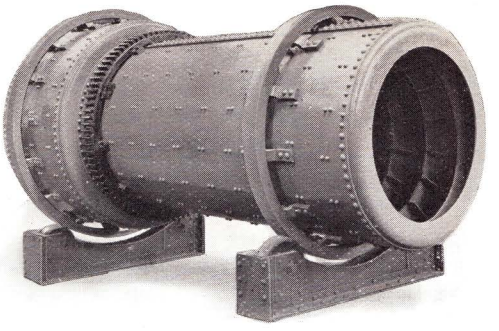
MIXERS FOR SILK MILLS.



GENERAL VIEW OF STRUCTURAL SHOP.

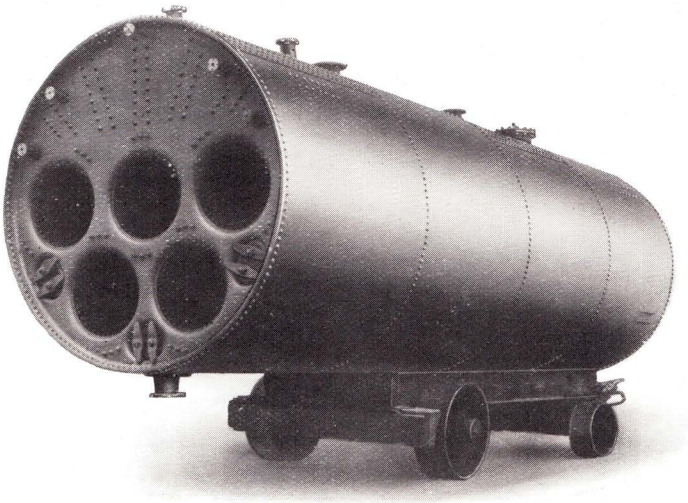


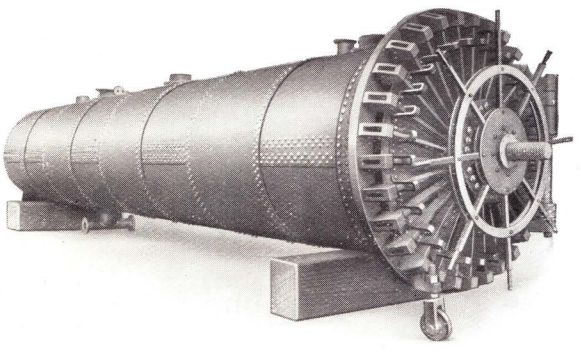
FLAT-ENDED (ANGLE-RING) LANCASHIRE BOILER.



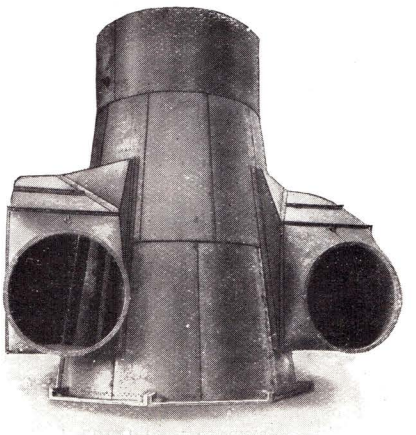
COAL WASHER.

SPECIAL FIVE-FLUED CYLINDRICAL BOILER, DESIGNED FOR WORKING IN CONNECTION WITH WASTE GASES FROM FURNACES, ETC.

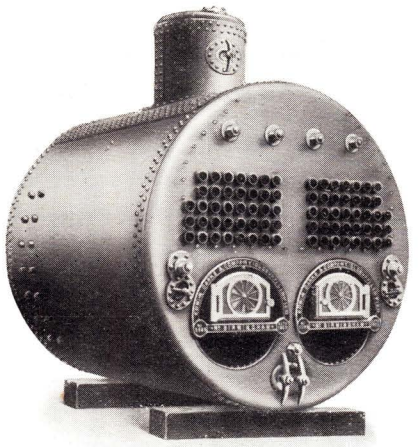




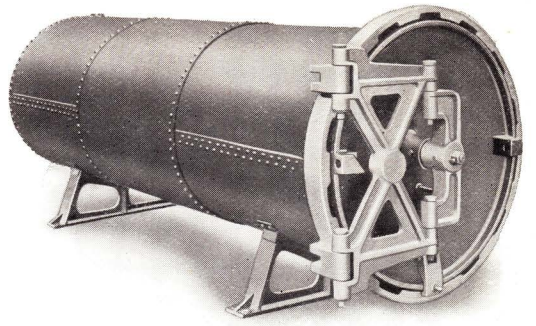
TIMBER IMPREGNATOR.



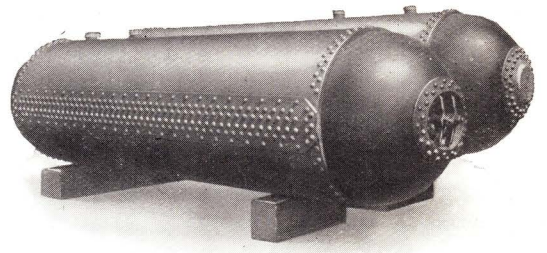
CHIMNEY BASE WITH DRAUGHT INLETS.



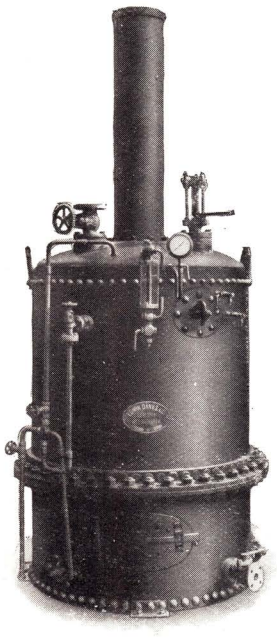
STANDARD SCOTCH BOILER
(WITHOUT SMOKE-BOX).



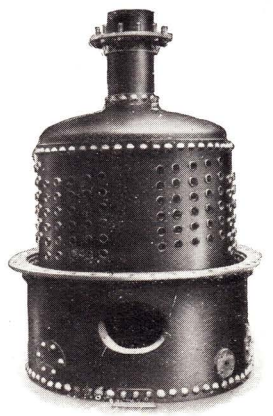
RUBBER VULCANIZER.



AIR, OIL AND STEAM RECEIVERS.

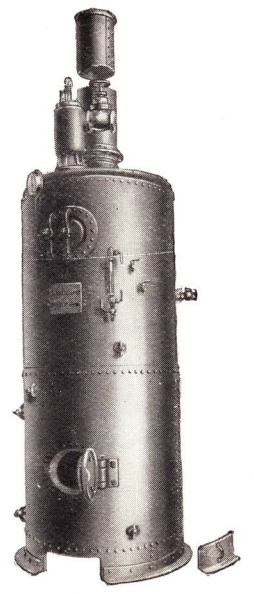


FRONT ELEVATION.



VIEW SHOWING TUBES.

STANDARD STEEL COLONIAL TUBULAR BOILER.



FRONT ELEVATION.
VERTICAL CROSS-TUBE BOILER.